



**Third Five-Year Review Report
For
BFI-Rockingham Landfill Superfund Site
Rockingham, Vermont**

September 2009

**Prepared by
U.S. Environmental Protection Agency**

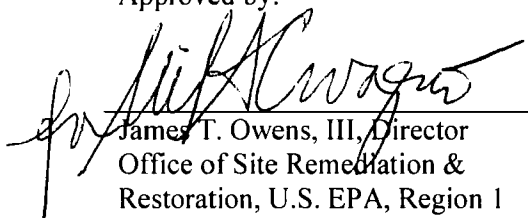
Superfund Records Center

SITE: BFI

BREAK: 8.3

OTHER: _____

Approved by:


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Date:

9-24-09

EXECUTIVE SUMMARY

The BFI-Rockingham Landfill Superfund Site (Site) in Rockingham, Vermont, was placed on the National Priorities List in 1989. In 1994, the U.S. Environmental Protection Agency (EPA) signed an Action Memorandum to initiate a Non-Time-Critical Removal Action (NTCRA). The NTCRA included the placement of a multi-layer cap over the landfill; expansion of existing gas extraction and treatment system; interception of shallow groundwater in a roadside collection trench; and institutional controls. In 1994, EPA signed a Record of Decision (ROD) selecting monitored natural attenuation and institutional controls as the long-term cleanup approach for the contaminated groundwater. Construction at the Site was completed in September 1996. Five-year reviews were completed in 1999 and 2004. This third five-year review was performed to assure that the selected remedy continues to be protective of human health and the environment.

This five-year review documents that the remedy remains protective of human health and the environment by minimizing immediate threats as envisioned by the ROD. Protectiveness is accomplished through continued operation of the landfill gas collection system, maintenance of the landfill cap, monitoring activities, provision of an alternate water supply to affected residents, and eventual restoration of the groundwater.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION

Site name: BFI-Rockingham Sanitary Landfill Superfund Site

EPA ID: VTD980520092

Region: 1 State: Vermont City/County: Rockingham/Windham

SITE STATUS

NPL status: ☒ Final Deleted Other (specify)

Remediation status (choose all that apply): Under Construction ☒ Operating Complete

Multiple OUs? YES ☒ NO Construction completion date: 09/26/1996

Has site been put into reuse? YES ☒ NO

REVIEW STATUS

Lead agency: ☒ EPA State Tribe Other Federal Agency

Author name: U.S. Army Corps of Engineers

Author title: Five-Year Review Manager Author affiliation: New England District

Review period: 09/21/ 2004 to 09/21/2009

Date(s) of site inspection: 5/4/09

Type of review:

☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ Regional Discretion ☐ NPL State/Tribe-lead

Review number: 1 (first) 2 (second) ☒ 3 (third) Other (specify)

Triggering action:

Actual RA Onsite Construction at OU
#

Actual RA Start at OU#

Construction Completion

Previous Five-Year Review Report ☒

Other (specify)

Triggering action date: 9/21/2004

Due date: 9/21/2009

FIVE-YEAR REVIEW SUMMARY FORM, CONT'D.

Issues:

Some minor issues were identified as a result of this five-year review.

The MCL for arsenic was lowered from 50 ug/l to 10 ug/l in the year 2006. However, because there is no exposure route, this change does not impact human health or the environment.

Some minor operation and maintenance items were identified in the 2009 Site inspection (see Appendix D). These items will be timely addressed by the PRPs and do not affect the protectiveness of the remedy.

Recommendations and Follow-up Actions:

The new arsenic MCL will be considered when evaluating the long-term cleanup of the groundwater.

Protectiveness

The remedy is considered to be protective of human health and the environment in the short-term and the long-term.

Short-Term Protectiveness is achieved because:

- There is no current exposure of Site related waste to humans or the environment at levels that would represent a health concern.
- The landfill cover system prevents exposure to the waste material and contaminants with the landfill.
- The private water line has eliminated groundwater use within the area impacted by the landfill. The small quantity of contaminated groundwater that may be reaching the Connecticut River is rapidly diluted.
- Landfill gas is collected and treated by the extraction system and enclosed ground flare.
- The land use restriction prevents any use of the land that would result in an exposure to hazardous substances, pollutants, or contaminants.

Long-Term Protectiveness will be achieved through continued performance of operation, maintenance, and monitoring activities along with the eventual restoration of the groundwater. Vermont Agency for Natural Resources (VT ANR) has reclassified the groundwater beneath the Site from a Class III to a Class IV aquifer which prohibits potable use. This provides an additional layer of protection to human health.

Other Comments:

None

TABLE OF CONTENTS

EXECUTIVE SUMMARY	ES-1
TABLE OF CONTENTS.....	1
LIST OF FIGURES	3
LIST OF TABLES	4
LIST OF ABBREVIATIONS AND ACRONYMS	5
1.0 INTRODUCTION.....	6
1.1 Regulatory Background.....	6
2.0 SITE CHRONOLOGY	7
3.0 BACKGROUND	8
3.1 Physical Characteristics.....	8
3.2 Land and Resource Use	9
3.3 History of Contamination.....	9
3.4 Initial Response	10
3.5 Basis for Taking Action	10
4.0 REMEDIAL ACTIONS.....	11
4.1 Remedy Selection	11
4.2 Remedy Implementation	13
4.3 Operation and Maintenance.....	14
5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW	14
5.1 Protectiveness Statements from Last Review	14
5.2 Status of Recommendations and Follow-Up Actions from the Last Review	15
5.3 Status of Other Prior Issues	15
6.0 FIVE YEAR REVIEW PROCESS.....	15
6.1 Administrative Components	15
6.2 Community Involvement.....	16
6.3 Document Review.....	16
6.4 Data Review	17
6.4.1 Groundwater	17
6.4.2 Surface Water.....	20
6.4.3 Leachate.....	21
6.4.4 Landfill Gas	21
6.4.5 Vapor Intrusion.....	21
6.5 Site Inspection	21
6.6 Interviews.....	22
7.0 TECHNICAL ASSESSMENT	22
7.1 Technical Assessment Questions.....	<u>22</u>

8.0 ISSUES	27
9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS.....	28
10.0 PROTECTIVENESS STATEMENT	29
11.0 NEXT REVIEW	29
12.0 REFERENCES.....	30
APPENDIX A – FIGURES	A-1
APPENDIX B – GRANT OF ENVIRONMENTAL RESTRICTIONS AND RIGHT OF ACCESS	B-1
APPENDIX C – MANN-KENDALL STATISTICAL TESTS (From URS, 2009, Appendix H).....	C-1
APPENDIX D – JUNE 2009 NOBIS SITE INSPECTION REPORT	D-1
APPENDIX E – INTERVIEW DOCUMENTATION	E-1

LIST OF FIGURES

Figure 1. Location of BFI Rockingham Landfill Site, Rockingham, Vermont.....	A-3
Figure 2. Site Plan, BFI-Rockingham Landfill Site, Rockingham, Vermont.....	A-5
Figure 3. Geologic section showing conceptual groundwater flow patterns and likely vertical extent of landfill-affected groundwater, BFI Rockingham Landfill Site, Rockingham, Vermont.....	A-7
Figure 4. Water-level hydrographs for selected wells and the Connecticut River, BFI Rockingham Landfill Site, Rockingham, Vermont.	A-9
Figure 5. Locations of residential wells and a spring sampled periodically near the BFI Rockingham Landfill Site, Rockingham, Vermont (modified from Balsam, 1994).	A-10
Figure 6a to 6g. Specific conductance and concentrations of contaminants in bedrock wells, BFI Rockingham Landfill Site, Rockingham, Vermont (modified from Balsam, 1994).	A-11
Figure 7a to 7c. Specific conductance and concentrations of selected contaminants in overburden wells, BFI Rockingham Landfill Site, Rockingham, Vermont.	A-15
Figure 8. Specific conductance, iron, and manganese concentrations in seep SW-6, BFI Rockingham Landfill Site, Rockingham, Vermont.	A-17
Figure 9. Flow rates to above-ground (AST), underground (UST), and condensate storage tanks, BFI Rockingham Landfill Site, Rockingham, Vermont.....	A-17
Figure 10. Specific conductance in above-ground (AST) and underground (UST) storage tanks, BFI Rockingham Landfill Site, Rockingham, Vermont.....	A-18

LIST OF TABLES

Table 2-1. Chronology of Site events.	7
Table 3-1. Groundwater Contamination Summary, BFI Rockingham Landfill Site, Rockingham, Vermont (EPA, 1994)	11
Table 6-1. Concentrations of Contaminants in Bedrock Wells that Exceed Cleanup Criteria for Groundwater and Trends, BFI Rockingham Landfill Site, Rockingham, Vermont (from URS, 2008, 2009)	19
Table 6-2. Concentrations of Selected Chemical Constituents in Water from Overburden Wells, And Trends, BFI Rockingham Landfill Site, Rockingham, Vermont (from URS, 2008; 2009)	20
Table 7-1. Toxicity Value Changes Potentially Affecting the Risk Estimates Supporting the ROD	26
Table 7-2. ARAR Changes Potentially Affecting the Interim Ground Water Cleanup Levels From the ROD	27

LIST OF ABBREVIATIONS AND ACRONYMS

ANR	Agency for Natural Resources
ARARs	Applicable or Relevant and Appropriate Requirements
AST	Above-Ground Storage Tank
BFI	Browning-Ferris Industries
CERCLA	Comprehensive Environmental Response, Compensation, and Liability
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
CVOC	Chlorinated Organic Compound
CWA	Clean Water Act
DEHP	bis-2-ethyl hexyl phthalate
EPA	United States Environmental Protection Agency
LTMP	Long-Term Monitoring Plan
MCLs	Federal Maximum Contaminant Concentrations
MCLG	Maximum Contaminant Level Goal
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NTCRA	Non-time Critical Remedial Action
O&M	Operation and Maintenance
PCE	Tetrachloroethene
PCOR	Preliminary Closeout Report
POTW	Publicly Owned Treatment Works
PRPs	Potentially Responsible Parties
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SOW	Statement of Work
SVOC	Semi-volatile Organic Compound
TCE	Trichloroethene
URS	URS Corporation
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VLDPE	Very low density polyethelene
UST	Underground Storage Tank
VOC	Volatile Organic Compound
VTDEC	Vermont Department of Environmental Conservation

1.0 INTRODUCTION

1.1 Regulatory Background

The United States Environmental Protection Agency (EPA) must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment.

CERCLA §121(c), as amended, states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the third five-year review for the BFI-Rockingham Landfill Superfund Site in Rockingham, Vermont (Appendix A, Figure 1), covering the period from October 2004 through September 2009. This review is required because the selected natural attenuation remedy for Site contaminants results in contaminants remaining at concentrations exceeding those associated with unrestricted exposure to media and unlimited use. The trigger for this statutory review was the signing of the second five-year review on September 21, 2004.

2.0 SITE CHRONOLOGY

The chronology of the Site, including significant Site events and dates, is included in Table 2-1.

Table 2-1. Chronology of Site events.

DATE	EVENT
1960's	Site location used as borrow pit
1968	Disposal Specialist, Inc. (DSI) Landfill begins operation after closure of the "Old Springfield Landfill"
1973	BFI of Vermont (BFI VT) acquires Disposal Specialist, Inc.
1980	Water-supply well installed to serve the facility and adjacent residents
1986-1989	Municipal incineration ash disposed in a lined cell at the landfill
1989	Disposal Specialists, Inc. Landfill is added to National Priorities List as BFI Sanitary Landfill
1989	BFI installs an active gas-collection system to limit migration of landfill gas
1992	U.S. Environmental Protection Agency (EPA) enters into agreement with Disposal Specialists, Inc. and BFI Vermont to perform Site-wide investigation
1992-1993	Groundwater-collection and slope-stabilization trench installed along Route 5
1993	EPA signs first cleanup decision, Action Memorandum, to initiate a Non-Time-Critical Removal Action (NTCRA) to place a cap on the landfill and to expand the gas-collection and treatment system
1994	EPA signed second cleanup decision, Record of Decision, identifying long-term monitoring and natural attenuation as the long-term cleanup approach.
1996	NTCRA completed (landfill cap, expanded active gas collection system, groundwater interceptor trench)
1996	EPA enters into agreement with DSI and BFI VT to perform long-term monitoring
1999	First Five-Year Review completed
September 2004	Second Five-Year Review completed
1997-2009	Ongoing Site monitoring, maintenance, and inspections.
April 2009	The Vermont Agency of Natural Resources (ANR) reclassified groundwater at the DSI Landfill from Class III to Class IV
September 2009	Third Five-Year Review completed (this report)

3.0 BACKGROUND

In the early 1960's, the 17-acre BFI Sanitary Landfill served as a borrow area for the construction of Interstate 91. In 1973, Browning-Ferris Industries, Inc., (BFI) bought the landfill from an individual who had started landfill operations in 1968. State files indicate that industrial wastes, including heavy metals, bases, pesticides, and volatile organic compounds (VOCs) were deposited in the unlined disposal area from 1968 to 1979. In 1983, the State of Vermont licensed the Site as a municipal landfill certified to accept hazardous waste from small quantity generators. The landfill was closed in 1991.

3.1 Physical Characteristics

The Site consists of a 17-acre solid-waste landfill and the surrounding areas impacted by the Site (Figure 2). The impacted areas include the overburden groundwater, bedrock groundwater, and at least three areas of leachate discharge and associated seep sediments along Route 5. Two leachate discharge areas have been dry since installation of an interceptor trench in 1996. There is a substantial floodplain/wetland area at the base of the steep slopes between the Site and the Connecticut River. However, wetlands and floodplain areas are not present within the 25-acre area that encompasses the landfill and an operating facility, which includes an office building, garage, a former solid-waste transfer station, and storage areas for the transfer station, and landfill gas extraction system.

Bedrock under the Site consists of moderately fractured black and gray inter-layered phyllite and slate in the Littleton Formation. Sulfide minerals are present within fractures, and fractures observed in rock cores and outcrops were frequently coated with reddish-brown oxides. Major fractures trend to the north-northeast (Balsam, 1994).

The northwest side of the landfill rests directly on the bedrock surface. Elsewhere, the landfill is on varved (i.e., there are multiple annual sediment layers) glacio-lacustrine sediments that thicken eastward and southeastward. These overburden sediments are about 200 feet thick on the southeast side of the landfill. From top to bottom, the overburden sediments include a sand and silty sand, varved clayey silt, silty sand grading downward to sand, and till (Figure 3). The clayey silt is the thickest overburden unit (Balsam, 1994).

Groundwater flows generally from west to east toward the Connecticut River in overburden and bedrock. On the east side of the landfill, water levels in wells completed in the upper sand and silty sand layers are more than 100 feet higher than water levels in the lower sand and bedrock. Water levels in deep bedrock are higher than water levels near the bedrock surface. Water levels in closely spaced wells in two locations (Figure 4a,b) indicate appreciable hydraulic-head differences at various depths and differences in water-level fluctuations. Water levels in well MW-6 completed in shallow bedrock are slightly higher than Connecticut River stage and appear to fluctuate with stage, indicating a close hydraulic connection to the river, probably through the lower sand. Conceptually, the lower sand serves as a conduit to the river for groundwater that leaks downward from the overburden and upward from bedrock. The dry wells in overburden shown on Figure 3 may reflect the very low hydraulic conductivity of the sediments or heads below the well bottoms. Figure 4 shows the gradual decline in water levels in shallow well MW-B13D near the edge of the cap for several years after the cap was completed in 1996; capping had no apparent effect, however, on water levels in shallow well MW-J35 located about 200 feet east of the cap. Water levels under the cap declined several feet to below the bottom of most gas-extraction wells after capping (URS, 2009).

Groundwater persists in landfill and underlying surficial materials for several possible reasons: water may enter the landfill area by lateral groundwater flow from hill slopes to the west; formerly-saturated landfill materials are still draining slowly by gravity; and biodegradation of landfill materials generates water. Leakage through the impermeable cap is considered to be negligible. Figure 3 shows conceptual flow patterns based on available water-level data.

3.2 Land and Resource Use

The land use within a one-mile radius of the Site supports primarily low-density residential housing, light agriculture, undeveloped forest land, and commercial activities. Approximately 2,700 people live within one mile and 6,400 people live within three miles of the Site. BFI supplies water to three homes near the Site from a “facility well” which is located outside the plume area. Several private residential wells and a spring near the Site (Rumhill) are sampled periodically (Figure 5). Natural resources near the Site include groundwater, surface water, fish and game, arable land, forest, woodland, and minerals.

The current and future land use of the landfill itself is considered non-residential because of the impracticality of constructing residences on such a closed landfill. Current land-use restrictions prevent development that could damage the cap. The areas surrounding the landfill are considered residential. However, much of the area surrounding the landfill is not suitable for development because of the steep topography. The general area of residences east of the landfill is shown on Figure 2 and on maps in Appendix B.

3.3 History of Contamination

From 1968 until 1991, the landfill received residential, commercial, and industrial solid and liquid waste. Approximately 1.2 million cubic yards of solid waste were disposed in the landfill during its operation. The landfill stopped receiving waste in November 1991.

Prior to the 1960s, the Site was undeveloped woodland. The Site was used as a borrow pit for road construction materials during the 1960's. In 1969, Disposal Specialist, Inc. (DSI) was created with Harry Shepard as the owner and operator of the landfill. Harry K. Shepard, Inc. performed the solid and industrial waste hauling operations at the Site. Browning-Ferris Industries, Inc. (BFI) purchased DSI and Harry K. Shepard, Inc. in 1973 and BFI continued the operation of the landfill under the name DSI. That same year, the waste hauling business name was changed from Harry K. Shepard, Inc. to Browning-Ferris Industries of Vermont, Inc. (BFIVT).

The landfill received municipal incineration ash from 1986 to 1989 that was disposed in a lined monofill cell in the southeastern section of the landfill (Figure 2). The monofill was subsequently capped as part of landfill capping. In 1989, BFI installed an active gas collection system to comply with the Vermont air pollution control regulations. Fans in the blower building extract landfill gases from numerous gas extraction wells through an underground piping network. The gases are then flared inside a stack. The gas collection system operates continuously except for short maintenance periods and when shut down by occasional power failures. The gas collection and treatment system is currently operated and maintained pursuant to a permit issued by the Vermont Air Pollution Control Division.

In the past, the overburden groundwater in the immediate vicinity of the landfill contained VOCs, semi-VOCs, and metals from landfill leachate. The overburden contamination plume east and downgradient of the landfill was limited to an area between the landfill and east side of Route 5. Contaminants at shallow depths extended short distances to discharge points at the top of ravines adjacent to Route 5 (EPA, 1994).

A groundwater collection trench along Route 5 was installed at a depth of 9 to 27 feet below the land surface, bounded on the east side by sheet pilings driven to an elevation of about 400 feet (NGVD). The trench has been the major point of discharge for leachate-contaminated groundwater since its construction in 1992-1993 (Balsam, 1994). A small amount of leachate-affected groundwater currently discharges seasonally to a seep (SW-6) on the south side of Route 5 (Figure 2).

The bedrock groundwater between the landfill and the Connecticut River also contained elevated levels of VOCs, semi-VOCs and metals, but at lower concentrations than in the overburden groundwater. The major contaminants were arsenic and manganese, which occur naturally in bedrock and were apparently mobilized by landfill leachate and a related change in pH in groundwater (EPA, 1994).

3.4 Initial Response

The State of Vermont has regulated the landfill's operations under its solid waste management program since 1968. In 1979, the Vermont Department of Environmental Conservation (VTDEC) collected and analyzed groundwater samples from six bedrock wells in the vicinity of the landfill. Because those samples were found to be contaminated by the landfill, the VTDEC required DSI to supply nearby residents with bottled water. In 1980, a new water supply well was installed on the DSI property southwest of the landfill (Figure 5) to service the facility and the residences. DSI entered into an agreement with the residents to maintain the water line for twenty years. With the installation of the clean water line, no residences have needed bottled water. In 2009, BFI was continuing to supply water to residences and maintain the water line. The water line will be maintained by BFI until EPA and VTDEC determine that the water beneath the residences is acceptable for use as a water supply (URS, 2009a). Several hydrogeologic investigations were performed during the 1980s by DSI pursuant to VTDEC requirements.

3.5 Basis for Taking Action

A Remedial Investigation (RI) was performed at the Site from 1992 to 1994 (Balsam, 1993, 1994). The RI identified the landfill as the source of contamination found in bedrock and overburden groundwater downgradient of the Site. Table 3-1 summarizes contaminants in groundwater. Surface water in the drainages along Route 5 was found to also contain Site-related contaminants.

Table 3-1. Groundwater Contamination Summary, BFI Rockingham Landfill Site, Rockingham, Vermont (EPA, 1994)

Contaminant of Concern	Interim Cleanup Level (µg/L)	Average Concentration (µg/L)	Maximum Concentration (µg/L)	Frequency of Detection
2-Butanone	170	18	370	2/34
Antimony	6	14	28	1/32
Arsenic	50*	49	282	18/32
Barium	1000	303	1850	30/32
Benzene	5	6	17	10/34
Bis (2-chloroisopropyl) ether	1	11	100	1/33
Bis (2-ethylhexyl) phthalate	6	8	62	10/33
Chromium	50	5	81	5/32
Manganese	180	1020	5830	28/32
Nickel	100	30	102	14/32
Pentachlorophenol	1	3	3	1/34
Tetrachloroethene	0.7**	5	12	2/34
Xylenes	400	82	1200	11/34
Vinyl Chloride	2	4	6	3/34

* The Federal MCL for arsenic has been reduced to 10 µg/L.

** The Vermont Groundwater Protective Standard for tetrachloroethene has been increased to 5 µg/L

The information collected during the Remedial Investigation and Feasibility Study (RI/FS) was used to conduct a Human Health and Ecological Risk Assessment. The results indicated that an unacceptable carcinogenic and non-carcinogenic risk would result from ingestion of bedrock groundwater. This was a hypothetical exposure scenario since no individuals were ingesting contaminated groundwater at the Site due to the provision of an alternate water supply. The carcinogenic risk results primarily from arsenic and vinyl chloride. Further, arsenic and manganese represented the majority of the non-carcinogenic risk at the Site under both average and maximum exposure scenarios. Constituents that exceeded a federal safe drinking water maximum contaminant level (MCL) or maximum contaminant level goal (MCLG) in bedrock groundwater during any of the five rounds of samples obtained at the Site during the RI include: antimony, arsenic, barium, benzene, bis (2-ethylhexyl) phthalate, chromium, nickel, pentachlorophenol, tetrachloroethene (PCE), and vinyl chloride. In addition to these substances, State of Vermont groundwater standards also were exceeded by 2-butanone, lead, and xylene. The Ecological Risk Assessment concluded that severe adverse effects on the Connecticut River were not likely.

4.0 REMEDIAL ACTIONS

4.1 Remedy Selection

Two CERCLA cleanup actions have been implemented at the Site. The first was a non-time critical removal action (NTCRA), which was described in a 1993 Action Memorandum. The NTCRA included: construction of a multi-layer landfill cap, expansion of the gas extraction system, and institutional

controls to protect the cap. The multi-layer landfill cap was constructed with a slope of 3:1 and included: a gas vent layer, a compacted till layer, a very low density polyethylene (VLDPE) geomembrane, a 2-inch layer of drainage aggregate, vegetative support soil, and topsoil. The second cleanup action that was described in the ROD (EPA, 1994) called for the natural attenuation of the groundwater, continued operation and maintenance of the NTCRA (landfill cap and gas extraction system), long-term monitoring, and institutional controls. The ROD established the following remedial action objectives:

Landfill (Source Area) Remedial Action Objectives

- Prevent to the extent practicable the potential for water to contact or infiltrate through the debris mass;
- Prevent to the extent practicable the generation of landfill seeps and the migration of landfill-impacted surface water into the Connecticut river;
- Control landfill gas emissions so methane gas does not present an explosion hazard; prevent to the extent practicable the inhalation of landfill gas containing hazardous substance, pollutants, or contaminants, and; meet state and federal air standards;
- Prevent to the extent practicable the migration of contaminated groundwater/leachate beyond the points of compliance by controlling the source of the contaminant;
- Minimize the potential for slope failure of the debris mass associated with the multi-layer landfill cap or any future action;
- Prevent to the extent practicable direct contact with and ingestion of soils debris within the landfill and beneath the landfill.

Groundwater Remedial Action Objectives

- Prevent to the extent practicable the ingestion of landfill-impacted bedrock groundwater exceeding EPA Safe Drinking Water Act MCLs, Vermont Primary Groundwater Quality Standards, or in their absence, the more stringent of an excess cancer risk of 1×10^{-6} for each compound or a hazard quotient of 1 for each non-carcinogenic compound by an individual who may use the bedrock groundwater within the area of landfill-impacted groundwater or within an area that could become impacted as a result of pumping activities;
- Restore the bedrock groundwater at the edge of the Waste Management Unit (the landfill solid-waste boundary shown on Figure 2) to: MCLs, Vermont Primary Groundwater Quality Standards, or in their absence, the more stringent of an excess cancer risk of 1×10^{-6} for each compound or hazard quotient of 1 for each non-carcinogenic compound.

Surface Water (Ecological) Remedial Action Objectives

- Protect off-site surface water by preventing the occurrence of landfill impacted seeps;
- Meet federal and state Applicable or Relevant and Appropriate Requirements (ARARs) for any surface-water discharge to the Connecticut River, and;
- Provide long-term monitoring of the surface water and sediments of the section of the Connecticut River adjacent to the landfill to assure that no landfill-related impacts occur in the future.

4.2 Remedy Implementation

The design of the NTCRA was initiated in October 1993 and completed in July 1994. The PRP contractor, Dames and Moore, mobilized to the Site in April 1994 to initiate Site preparation activities and install additional gas extraction wells. The expansion of the gas extraction system and Site preparation activities were completed in May 1994. The multi-layer landfill cap was complete over seventy-five percent of the landfill by December 1994. The remaining 25 percent of the multi-layer landfill cap was complete by July 1995. All surface-water control systems were complete by August 1995, and a vegetative cover was established by October 1995.

EPA, Vermont Department of Environmental Conservation (VTDEC), and the oversight contractor performed a pre-final inspection of the landfill in December 1995 and a final inspection in May 1996. The cap and all related systems were determined to be constructed according to design, with a well-established vegetative cover. The construction activities and completion were documented in a Completion of Work Report that was approved by EPA in September 1996. The report documented the completion of the NTCRA and the initiation of Post-Removal Site Control/Operation and Maintenance by the PRPs.

The ROD (EPA, 1994) called for natural attenuation, monitoring, institutional controls, and maintenance of the NTCRA. No construction activities were required by the ROD. EPA approved the Monitoring Plan for the Natural Attenuation ROD in May 1996. The Institutional Controls were completed in June 1996 by "Grant of Environmental Restrictions and Right of Access" for seven parcels of land, including the landfill and adjoining areas (Appendix B) (Town Clerk's Office, Rockingham, VT, 1996). The deed restrictions affect the following areas within these parcels, which are depicted in Appendix B. The following summary is from URS (2008a):

- **The Capped Area (capped portion of Parcel 7)** – In this area, uses are prevented that disturb the integrity of layers of the cap, the leachate collection system, the gas collection and treatment system, or any other structures for maintaining the effectiveness of the Removal Action and the Remedial Action.
- **The Groundwater Restriction Area (Parcels 1 through 6, and portions of Parcel 7)** – This area is defined as the portion of the Site where contaminants were detected above groundwater cleanup levels during the RI. In this area, use of groundwater as a drinking water supply is prohibited.
- **The Waterline Restriction Area** – Alterations or disturbances to the waterline that supplies potable water to three year-round residential properties are prohibited in this area. The restrictions apply to the Water Line Supply Well and all structures and equipment related to it, as well as to the water line itself.
- **The Properties and Parcel 7 (Parcels 1 through 7)** – Activities and uses that disturb the Removal Action and the Remedial Action (as defined in the ROD) are prohibited in this area.

EPA signed a Preliminary Closeout Report (PCOR) for the entire Site (NTCRA and Remedial Action) in September 1996 upon completion of the cap. The PCOR confirmed that no additional monitoring wells or other construction activities were necessary at the Site.

4.3 Operation and Maintenance

The operation, maintenance, and monitoring activities are currently being implemented by the PRPs. Monitoring and maintenance reports are submitted to EPA and Vermont Agency for Natural Resources (ANR) for review. In addition, EPA has an oversight contractor perform Site inspections and oversee the PRP activities. The operation, maintenance, and monitoring activities focus on:

- The vegetative cover of the cap and repair of any erosion;
- Balancing the landfill gas extraction system and repair of any wells or conveyance lines;
- Shipment of leachate to an off-site treatment plant; and
- Collection and analysis of samples to monitor contaminant trends in groundwater;
- Providing water for private use and maintaining the water line.

Operations costs are summarized in Table 4-1.

Table 4-1. Annual System Operations/O&M Costs, BFI Rockingham Landfill Site, Rockingham, VT (URS, 2009, Written Communication).

Year	System Operation Costs
2008	\$341,110.78
2007	\$293,984.04
2006	\$264,502.02
2005	\$232,849.20
2004	\$282,275.07

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the third five-year review for the Site. The previous review was completed in September 2004. The routine operation, maintenance, and monitoring activities have continued since the last review.

5.1 Protectiveness Statements from Last Review

The last Five-Year Review stated that the remedy is considered to be protective of human health and the environment in the short-term and long-term. It found that for the exposures envisioned in the ROD, short-term protectiveness is achieved because:

- There currently is no exposure of Site-related waste to humans or the environment at levels that would represent a health concern;
- The landfill cover system prevents exposure to the waste material and contaminants within the landfill;
- The private water line has eliminated groundwater use within the area impacted by the landfill. The small quantity of contaminated groundwater that may be reaching the Connecticut River is rapidly diluted by the flow;
- Landfill gas is collected and treated by the extraction system and enclosed flare;
- The land use restriction prevents any use of the land that might result in an exposure to hazardous substances, pollutants, or contaminants.

The last five year review also stated, long-term protectiveness will be accomplished through continued performance of operation, maintenance, and monitoring activities along with the eventual restoration of the groundwater. A reduction in the cleanup level for arsenic will be necessary before certification of long-term protectiveness.

5.2 Status of Recommendations and Follow-Up Actions from the Last Review

The following recommendations were identified in the last Five-Year Review:

- The sampling methodologies in the sampling and analysis plan should be reevaluated. If possible, low-flow sampling methodologies should exclusively be used. In addition, a consistent sampling methodology should be used for wells with a very low water yield.
- Depth to water measurements should be taken in tandem with water-quality measurements in order to monitor drawdown during well purging and sampling activities.
- As specified on page D-20 of the Quality Assurance Project Plan (QAPP) prepared by Dames & Moore and dated April 1997, groundwater sampling and sample handling activities are to be documented using a field logbook. At the time of EPA oversight inspection, it did not appear that logbooks were used to document the sampling procedures. The sampling contractor should retain a copy of the QAPP and other sampling plans with them during sampling, and that a field logbook be used to document all sampling activities.
- As specified on page D-15 of the above-referenced QAPP, all samples should be preserved immediately after they are collected or the bottles pre-preserved before sampling to maximize sample integrity.

These recommendations for sampling were generally followed, as indicated in semi-annual monitoring reports. Low-flow sampling was not possible in two low-yield wells (MW-3 and MW-B13D).

5.3 Status of Other Prior Issues

The only other issue identified by the last review was revision of the cleanup level for arsenic to reflect the change in the MCL from 50 µg/L to 10 µg/L, which was promulgated in 2001 but not implemented until 2006. In this respect, the sampling report from fall 2008 was still reporting a cleanup criteria of 50 µg/L for arsenic. The Site cleanup level for arsenic has not been officially changed to 10 µg/L.

6.0 FIVE YEAR REVIEW PROCESS

This five-year review was conducted in accordance with EPA's most current five-year review guidance (EPA, 2001). Tasks completed as part of this five-year review include review of pertinent Site-related documents, interviews with parties associated or familiar with the Site, an inspection of the Site, and a review of the current status of regulatory or other relevant standards.

6.1 Administrative Components

EPA, the lead agency for this five-year review, notified VTDEC and the PRPs that the Five-Year review would be completed by September 2009. The Five-Year Review Team was initially led by Ed Hathaway and later by Almerinda Silva, Remedial Project Managers, for the BFI Rockingham Landfill Superfund

Site and included staff from the Army Corps of Engineers and Nobis Engineering Inc. Michael Smith from the VT DEC was also part of the review team. The review components included:

- Community Involvement
- Document Review
- Data Review
- Site Inspection
- Local Interviews; and
- Five-Year Report Development and Review

6.2 Community Involvement

EPA issued a public notice that was published in the Brattleboro Reformer on August 8, 2009. The notice briefly described the Site, five-year review process, and how the community can contribute during the review process.

6.3 Document Review

The five-year review included a review of relevant documents including:

- Record of Decision (EPA, 1994)
- Remedial Investigation/Feasibility Study (1994)
- Supplemental Remedial Investigation (1994)
- Grant of Environmental Restrictions and Right of Access
- Previous Five-Year Reviews (EPA, 1999; EPA, 2004)
- Monitoring reports for 2007 and 2008
- Site inspection reports
- Technical memoranda
- Monitoring data provided by URS (2009)
- Class IV groundwater reclassification petition (URS, 2008)

Applicable and appropriate requirements (ARARs) in effect at the time of the ROD (EPA, 1994) were also reviewed. These included:

- Resource Conservation and Recovery Act (RCRA)
- Clean Water Act (CWA)
- Safe Drinking Water Act (SDWA)
- Executive Order 11990 (Protection of Wetlands)
- Executive Order 11988 (Floodplain Management)
- Clean Air Act (CAA)
- Vermont Ground Protection Rule and Strategy
- Vermont Water Quality Standards
- New Hampshire Water Quality Standards
- Vermont Act 250 (criteria that must be addressed by an improvement to the property)
- Vermont Hazardous Waste Management Regulations
- Vermont Wetland Rules

Additionally, the ROD identifies the following as “To-Be Considered” criteria:

- Safe Drinking Water Act Proposed MCLs
- EPA Human Health Assessment Cancer Slope Factors
- EPA Reference Doses
- Vermont Health Advisories
- Federal Ambient Water Quality Criteria
- NOAA ER-1 and ER-M Sediment Criteria
- EPA Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (EPA/530-SW-89-047, July 1994).

Further discussion of ARARs and “To-Be-Considered” criteria is provided in Section 7.1.

6.4 Data Review

A long-term monitoring program has been implemented to monitor the natural attenuation of Site-related contamination, as required by the ROD. Environmental monitoring data are available for groundwater (including water from the interceptor trench), a seep (SW-6), and leachate from the lined ash monofill cell. Data for each medium is summarized below. Sampling in the Connecticut River was discontinued in 2005 because no adverse effects from the landfill were detected after 22 sampling events (URS, 2008).

6.4.1 Groundwater

Groundwater levels in wells on the east side of the landfill are near the surface in shallow overburden wells and over 100 feet deep in the shallow bedrock. Water levels in shallow wells near the landfill stabilized within 3 years of capping but now fluctuate in response to seasonal recharge cycles. Water levels in most shallow wells typically fluctuate over a range of 6 to 10 feet (Figure 4). Groundwater flow patterns have not changed during the five-year review period (URS, 2007, 2008).

Groundwater quality has been monitored in bedrock and overburden since 1994. Monitoring wells are sampled for VOCs, SVOCs, and metals semi-annually. Cleanup levels for contaminants of concern in bedrock were established in the ROD and were to be achieved by 15 years after completion of the cap (by the year 2011). Although cleanup standards for overburden were not specified in the ROD, monitoring has been implemented to assess possible migration of contaminants to bedrock or potential receptors.

Water samples are collected annually in the fall at two residential wells (Greenwood, Rumrill Spring) and at the facility well. An additional 9 private residential wells are sampled on a five-year rotational schedule (URS, 2009). No contaminants were detected at these locations during 2004-2009. Locations of residential wells sampled near the landfill are shown in Figure 5.

Contaminants in Bedrock Groundwater

VOCs that were observed in bedrock groundwater samples collected in the spring and/or fall 2008 at concentrations above current (2009) cleanup criteria included benzene (wells MW-3 and MW-6), and total xylenes (well MW-3). Inorganic constituents that were observed in concentrations above cleanup criteria included arsenic (wells MW-3 and MW-6), manganese (wells MW-3, MW-4, MW-7, MW-G25, and MW-J37), and chromium (well MW-9). Concentrations of these chemicals in the spring and fall of 2008 and trends determined from a Mann-Kendall statistical analysis (detailed results in Appendix C) are shown in Table 6-1. Trends for selected contaminants and specific conductance are shown graphically in

Figures 6a to 6g. Graphs are included for wells where contaminants have historically exceeded cleanup criteria.

Contaminant concentrations in water from bedrock have been declining or remained stable. An exception is for water from well MW-7, where concentrations of manganese have been increasing. However, this increasing trend is likely a result of a change in the oxidation/reduction potential of the groundwater as opposed to a migrating plume of manganese from the landfill.

The lateral extent of VOCs in bedrock groundwater that exceed cleanup criteria downgradient of the landfill appear to be limited to a narrow band between MW-3 and MW-6 (Figure 2). Concentrations of PCE have declined below cleanup criteria in wells MW-9 and MW-10 but remain above detection levels and the ROD-specified cleanup goal of 0.7 ug/L. The ROD (EPA 1994) stated that the plume in bedrock may extend to the north of well K-40 because of low levels of TCE (4 ug/L) and PCE (2 ug/L) were observed. Subsequent sampling of wells K-39, K-40, J-37, and J-38 indicated non-detects and sampling at these wells was discontinued in 2004 and 2005.

Table 6-1. Concentrations of Contaminants in Bedrock Wells that Exceed Cleanup Criteria for Groundwater and Trends, BFI Rockingham Landfill Site, Rockingham, Vermont (from URS, 2008, 2009)

Well Number	Geologic Unit	Analyte	Cleanup Criteria* (µg/L)	Spring 2008 Concentration (µg/L)	Fall 2008 Concentration (µg/L)	MKTrend ¹ (through Fall 2008)
MW-3	SBR	Benzene	5	11	Not sampled	D
MW-3	SBR	Total Xylenes	400	1700 (D)	Not sampled	Undefined
MW-3	SBR	Arsenic	10	571	Not sampled	D
MW-3	SBR	Manganese	180	552	Not sampled	D
MW-4	DBR	Manganese	900	5,370	6,150	D
MW-6	SBR	Benzene	5	6.2	6.0	D
MW-6	SBR	Arsenic	10	239	241	S
MW-6	SBR	Manganese	180	1,640	1930	S
MW-9	SBR	Chromium	50	264	98	D
MW-7	DBR	Manganese	900	1,540	1620	I
MW-G25	SBR	Manganese	900	1,090	5,740	S
MW- J37	SBR	Manganese	900	3,870	3,040	S

* Based on current MCLs of 10 µg/L for arsenic and 5 µg/L for tetrachloroethylene.

The cleanup criterion for manganese is 180 µg/L unless manganese is the only metal above the cleanup criteria, then a cleanup criterion of 900 µg/L is used.

µg/L = micrograms per liter.

U = Not detected above reported detection limit

(D) = Compound identified after analysis with secondary dilution.

MK Trend¹ is based on Mann-Kendall statistical analysis - see Appendix C (Appendix H from the Fall 2008 report).

Undefined; Mann-Kendall statistical analysis not performed for Fall 2008 report. Concentrations vary over a wide range between sampling periods.

D = Decreasing trend at minimum 80% confidence interval.

I = Increasing trend at minimum 80% confidence interval.

S = No trend but stable.

NA = Not analyzed. Data set not suitable for Mann-Kendall (MK) statistical analysis.

Geologic Unit: SBR = shallow bedrock; DBR = deep bedrock

Contaminants in Overburden Groundwater

A leachate plume in overburden extends eastward from the landfill in the direction of groundwater flow toward channels cut in the overburden sediments. The estimated lateral extent of elevated VOCs, indicators of landfill leachate, is about 600 feet wide between wells MW-J35 and bedrock wells MW-9 and MW-10 (Figure 2). An exception is the presence of methylene chloride and 2-butanone in well MW-E22.

Although cleanup criteria have not been specified for groundwater in overburden, the cleanup criteria for bedrock groundwater are useful screening levels for describing the groundwater quality. Several contaminants are present at elevated concentrations in Well MW-B13D near the eastern edge of the landfill (Table 6-2). The concentrations are generally declining or remain stable (Table 6-2, Figures 7a to 7c). Elevated levels of methylene chloride, 2-butanone, and vinyl chloride, along with specific conductance (an indicator of leachate in groundwater), have been detected in well MW-J35 (Table 6-2, Figure 7c).

Table 6-2. Concentrations of Selected Chemical Constituents in Water from Overburden Wells, And Trends, BFI Rockingham Landfill Site, Rockingham, Vermont (from URS, 2008; 2009)

Well Number	Geologic Unit	Analyte	Screening Level (µg/L)	Spring 2008 Concentration (µg/L)	Fall 2008 Concentration (µg/L)	Trend (through Fall 2008)
MW-B13D	OB	Arsenic	10	39.6	Not sampled	D
MW-B13D	OB	Barium	1000	11,500	Not sampled	D
MW-B13D	OB	Manganese	180	272	Not sampled	D
MW-B13D	OB	Benzene	5	8.1	Not sampled	S
MW-B13D	OB	Total Xylenes	400	550	Not sampled	S
MW-B13D	OB	Vinyl Chloride	2	2.5 U	Not sampled	NA
MW-B13D	OB	Tetrachloroethene	5	2.5 U	Not sampled	NA
MW-E22	OB	Methylene Chloride	5	92 (D)	250 (D)	I
MW-E22	OB	2-Butanone (Methyl Ethyl Ketone)	170	460 (D)	1400 (D)	I (obs)
MW-J35	OB	Methylene Chloride	5	25 U	100	I (obs)
MW-J35	OB	2-Butanone (Methyl Ethyl Ketone)	170	1400	2000	I (obs)
MW-J35	OB	Vinyl Chloride	2	170	140	I (obs)

µg/L = micrograms per liter.

Trend is based on Mann-Kendall statistical analysis - see Appendix C.

D = Decreasing trend at minimum 80% confidence interval.

I = Increasing trend at minimum 80% confidence interval.

I (obs) = Observed increase; Mann-Kendall statistical analysis not performed for Fall 2008 data report.

S = No trend but stable.

Screening level based cleanup criteria for bedrock groundwater.

Geologic Unit: OB = overburden

6.4.2 Surface Water

Since the Route 5 System Collection Trench was installed, Seep SW-6 is the only known discharge point outside the collection trench system (Figure 2). Seep flow is typically less than 0.5 liters per minute (URS, 2008, 2009). Metal concentrations are typically below storm water discharge requirements. Iron concentrations are highly variable and sometimes exceed the discharge requirement of 31,000 µg/L. Specific conductance, manganese, and iron-concentration trends are shown graphically in Figure 8. VOCs observed in SW-6 include 2-hexanone, acetone, benzene, chloroethane, ethylbenzene, methyl ethylketone, toluene, and xylenes. Acetone has been detected consistently during the five-year review period, but the other VOCs are commonly below detection limits. This is a seasonal small seep which is located in a thickly wooded brush area on a steep slope which does not allow for easy access.

Samples have not been collected from the Connecticut River since 2005 in accordance with a modification of the Long-Term Monitoring Plan (LTMP) (Dames & Moore, 1997) approved by EPA.

6.4.3 Leachate

An above-ground storage tank (AST) receives water that is pumped from the groundwater collection trench (Seepage Control System) along Route 5. An underground storage tank (UST) receives water that seeps from the ash monofill.

Flow rates to the AST were nearly steady for 1998-2008 at about 2,750 gallons per day (1.91 gal/min) (Figure 9). Rates of inflow to the AST appear to correlate with water levels in shallow wells near the landfill. The comparatively high rates of flow since 2004 can be attributed to higher recharge rates near the landfill, as indicated by higher water levels in well MW-B13D (Figure 4) for the same period. Conceptually, groundwater recharge varies with precipitation within the area between the landfill cap and the collection trench. The water is collected several times a week and trucked to the Palmer, Massachusetts, Waste Water Treatment Plant for disposal. VOCs detected in AST water during spring and fall sampling rounds include dichloroethane, chloroethane, ethylbenzene, methylene chloride, and toluene. The specific conductance of leachate has been gradually declining since the landfill was closed (Figure 10).

Flow rates to the UST, which receives seepage from the ash monofill, declined appreciably from about 1,870 gallons per day (1.3 gal/min) before capping (URS, 2008) to a fairly steady rate of 100 gallons per day (0.07 gal/min) for 1998-2008 (Figure 9). The leachate is collected periodically and trucked to the Palmer, Massachusetts, Waste Water Treatment Plant for disposal. VOCs are typically below detection limits. The specific conductance of leachate has been gradually declining since the landfill was closed (Figure 10).

The gas extraction system produces a condensate that drains by gravity to a tank located east of the landfill. The condensate is also trucked to the waste water treatment plant. Condensate production rates are shown in Figure 9.

6.4.4 Landfill Gas

Semi-annual inspection reports submitted to the EPA Remedial Project Manager by a contractor to EPA do not report odors or problems related to landfill gases

6.4.5 Vapor Intrusion

Vapor intrusion to occupied dwellings east of the landfill through unsaturated soils is unlikely because of the distance of the dwellings from the leachate plume in overburden.

6.5 Site Inspection

A Site inspection on May 4, 2009, was attended by USACE personnel, EPA personnel, and Site contractors. Results of the inspection are operation and maintenance related and do not impact the protectiveness of the remedy as they are regularly addressed by the PRPs. These results are reported on the Site Inspection Form in Appendix D and are summarized as follows:

- The landfill cap is in good condition with no evidence of erosion, cracks, or slumping
- Differential settling has been observed in the cap during the semi-annual inspections. The settling does not appear to affect the cap performance.

-
- The landfill gas management system was operating at the time of the inspection.
 - The enclosed flare was operating to destroy the gas and associated contaminants.
 - The surface of the Route 5 groundwater collection trench was in good condition.
 - Water-hauling records indicate the ashfill leachate and Route 5 collection trench continue to collect groundwater.
 - The Site access roads were in good condition.
 - The gabion retaining walls on the east side of the Site were generally in good condition with one exception where a minor bulge was observed. Shrubs growing from the baskets in some areas should be removed by BFI to protect the structural integrity of the baskets.
 - The storm-water drainage swales and detention basins were in good condition and appeared to be functioning, as designed.
 - The above-ground overflow drainage pipe on the north side of the Site is securely anchored.
 - Landfill slopes are stable and well vegetated with grass.
 - Most landfill gas riser pipes lean downhill. Site inspection reports indicate that the leaning can be attributed to differential settling of landfill materials. Edward Hathaway, EPA Remedial Project Manager, reported during the Site visit that tests at one leaning pipe demonstrated that the distortion has not affected the integrity of the cap nor the ability to extract gas.

Site inspections have been performed semi-annually by the PRPs, EPA (or their oversight contractor), and Vermont ANR since 1999. There have been no major issues regarding the operation and maintenance of the landfill remedial system.

6.6 Interviews

Interviews were conducted with representatives of the EPA, the VTDEC, the Town of Rockingham, Vermont, a representative of the PRPs, and a local resident. Interview Record forms are provided in Appendix E.

Generally, based on the results of the interviews conducted, implementation of the selected remedy has proceeded without significant issue or concern. The interview with Michael Smith, VTDEC, stated that groundwater classification for the Site area has changed from Class III to Class IV. This change provides additional protection from ingestion of groundwater. The Vermont classification does not distinguish between groundwater in bedrock and groundwater in overburden. Representatives from the Town of Rockingham stated there have been no complaints regarding the Site and the associated activities. The Librarian at the Rockingham Free Library stated that Site-related documents are available at the library. No new issues were identified during the interviews.

7.0 TECHNICAL ASSESSMENT

7.1 Question A: Is the remedy functioning as intended by the decision documents?

Remedial Action Performance

Yes. Evidence to indicate that the remedy is performing as intended include the following:

- The groundwater monitoring data indicate a general reduction in contaminant concentrations since the implementation of the remedy. Concentrations of VOCs and metals in perimeter groundwater monitoring wells have reduced or remain consistent over the past five years. SVOCs concentrations are below cleanup levels. However, in well MW-J35 there is a trend that shows some constituents increasing over time. Based on the groundwater monitoring data collected to date, it appears that the landfill cap has successfully minimized the infiltration of water through the source of the contamination (i.e., the waste mass) thus minimizing the migration of contaminated groundwater beyond points of compliance. The one exception is the increasing trend of manganese at MW-7. However, this increasing trend is likely the result of a change in the oxidation/reduction potential of the groundwater as opposed to a migrating plume of manganese from the landfill.
- The landfill cap remains intact to isolate and prevent the direct contact with the solid waste contained within the landfill.
- The lack of new seep development at the Site and the apparent low flow of Seep SW-6 indicate the landfill cap and Route 5 groundwater interceptor trench are effectively reducing the flow of contaminated shallow groundwater that could develop into seeps and potentially impact surface water.
- The reduction in the groundwater elevations near the landfill and the dramatic decline in the flow of leachate collection system are both indicators that the landfill cap has minimized the infiltration of surface water through the debris mass.
- The landfill gas management system has controlled landfill gas emissions so methane gas does not represent an explosion hazard, and prevented the inhalation of landfill gas containing hazardous substances, pollutants, or contaminants.
- The debris mass and multi-layer cap appears to be stable against slope failure at this time.

While the structural components of the remedy appear to be functioning as intended, the lack of decreasing concentration trends suggests that the cleanup criteria will not be met at many of the monitoring wells by the next five-year review as required by the ROD for natural restoration remedy to be considered successful. A review of the natural restoration component of the remedy will be conducted as part of the next five year review.

System Operations/O&M

Operation and maintenance of the cap, landfill gas management system, leachate collection, and Route 5 groundwater extraction system has been, and continues to be effective. Issues identified during the semi-annual site inspections are promptly addressed or continue to be monitored as recommended.

The monitoring well network appears to be adequate to define the current extent of the groundwater plume.

Opportunities for Optimization

The five-year review did not identify any areas where changes in the operating procedures would further optimize the cleanup actions.

Early Indicators of Potential Issues

While the physical components of the remedy are in good condition and appear to be functioning as intended, there is a concern that some contaminants show an increasing rather than decreasing or stable trend, and the groundwater may not achieve the cleanup levels in the 15 year time period identified in the ROD and CD. The next five years will be a critical time for monitoring and assessment to identify whether cleanup levels will eventually be met or other measures need to be implemented or a technical impracticability waiver should be considered.

Implementation of Institutional Controls and Other Measures

Measures to control access include fencing of the landfill to limit access. A restrictive covenant has also been placed on the property to prevent the use of contaminated groundwater. Further, VT ANR has reclassified the groundwater from a class III to a class IV which prohibits potable use. No activities were observed that would have violated the institutional controls.

Adequacy of Monitoring Plans

A review of the sampling and analytical procedures was conducted to determine the need to update any of the monitoring plans used to evaluate the performance of the remedy. While the evaluation of the remedy over the next five years will be critical in supporting an evaluation as to whether the 15 year time frame for restoration is achieved, the program specified in the approved site plans should be adequate to provide information necessary to determine if the cleanup levels will be met.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

Yes. Each of these factors was evaluated with respect to maintaining the protectiveness of the remedy.

Exposure Pathways,

The exposure assumptions used to develop the Human Health Risk Assessment included:

1. Ingestion of groundwater;
2. Direct contact with leachate; and
3. Inhalation of the contaminants from the soil, groundwater, surface water, and leachate by workers or other individuals.

These exposure assumptions are still valid. Potential exposure from these pathways has been addressed by installation of an alternate water supply, landfill cap, leachate and landfill gas collection system, and security fence.

Potential vapor intrusion of VOCs into buildings was not included as a potential exposure pathway in the ROD, but was assessed as part of this five year review. The ROD states:

Air exposure outside the landfill was not considered a potential exposure pathway and was only qualitatively assessed. The factors included in the qualitative assessment were: (1) the fact that the overburden ground water, which contains the higher levels of volatile organic compounds, does not extend to the area of residences adjacent to the landfill) and (2) the volatile organic compound levels in the bedrock ground water beneath the residences are very low.

Also:

EPA concluded that basement vapor were not a potential exposure pathway. Although the bedrock plume does extend beneath the residences, the levels of VOC in the bedrock are very low (16 parts per billion of TCE as the highest level). These levels would not represent a potential vapor threat. In addition, there is no evidence of contaminated overburden ground water beneath the residences. Bedrock outcrops are present in the yard for one of the residences and the basement of a second home is reported to have been built on bedrock. The lack of overburden ground water north of MW-8 also supports this conclusion. Further evaluations of the potential for overburden ground water in the area of the residents will be performed as part of the Long-Term Monitoring Program.

Since that time vapor intrusion has become recognized as a potentially important exposure pathway for VOCs at very low concentrations. Nevertheless, vapor intrusion does not affect protectiveness of the remedy because currently VOC's have not been found in the bedrock groundwater plume, and there are no occupied structures within several hundred feet of the contaminated overburden groundwater plume, and because land use controls exist to prevent construction in the area.

Toxicity and other Contaminant Characteristics

Barium is the only toxicity value to change since the last five year review. Since the time of the ROD, a reference dose for vinyl chloride was developed, and the reference dose for 2-butanone was revisited but kept the same. The change in the toxicity value for arsenic, benzene, and trichloroethylene are minor with no implications to protectiveness. The change in the toxicity value for barium, chromium, manganese, and vinyl chloride are less stringent than they previously were, so protectiveness is maintained. The toxicity value for xylene is more stringent than it formerly was. Although these changes may affect the timeline of the remedy, protectiveness is maintained at the Site since there are no known exposures or uses of the contaminated bedrock (or overburden) groundwater. See Table 7-1 for a summary of changes in toxicity values.

Table 7-1. Toxicity Value Changes Relating to Risk Assessment Estimates Supporting the ROD

Contaminant of Concern	Noncancer Oral Reference Dose (mg/kg*day)		Cancer Oral Slope Factor (mg/kg*day) ⁻¹		Last Revision
	Original	Revised	Original	Revised	
Antimony	0.0004	--	--	--	1991
Arsenic	0.0003	--	1.75	1.5	1995
Barium	0.07	2	--	--	2005
Benzene	0.004	--	0.029	0.015 to 0.055	2003
Bis (2-chloroisopropyl ether)	0.04	--	0.07	--	1989
Bis(3-ethylhexyl phthalate)	0.02	--	0.014	--	1988
2-Butanone	0.05	--	--	--	2003
Chromium	0.005	1.5	--	--	1998
Lead	Biokinetic	--	--	--	2004
Manganese	0.005	0.024	--	--	1995
Methylene Chloride	0.06	--	0.0075	--	1991
Nickel	0.02	--	--	--	1991
Pentachlorophenol	0.03	--	0.12	--	1991
Tetrachloroethylene	0.01	--	0.05	--	1988
Trichloroethylene	0.0003	--	0.011	0.013	2009
Vinyl Chloride	0.003	--	1.9	0.72	2000
Xylene	2	0.2	--	--	2003

-- Toxicity value has not been revised.

ARARs and To-Be-Considered Standards

The interim cleanup levels are generally at the MCL prevailing at the time of the ROD. The MCL for arsenic and the VT Groundwater Protective Standard for lead has decreased since that time. The federal MCL for arsenic was reduced from 50 ug/L to 10 ug/L in 2006, although the toxicity value underlying the reduction has not changed since 1998. Also, the Vermont Groundwater Protective Standards for tetrachloroethylene have been revised (increased) to be consistent with Federal MCLs. Despite these changes, protectiveness of the remedy is maintained in the short-term due to the provision of an alternate water supply. At a future time, EPA will formally determine whether revisions to these ARARs since the issuance of the ROD should be reflected in the groundwater cleanup standards for the remedy. See Table 7-2 below for further information

Revised ARARs may be adopted as updated Interim Ground Water Cleanup Levels. The interim cleanup levels are based upon ARARs and health-protective criteria. The ROD provides for changes to ARARs during the monitoring period since advances in knowledge may call into question the protectiveness of the remedy. Revisions resulting in less stringent ARARs could decrease the time needed to achieve the cleanup goals, whereas more stringent ARARs could increase the time needed. Confirmation of overall protectiveness upon attainment of the interim cleanup levels and/or new or modified ARARs will be determined with a risk assessment.

Table 7-2. ARAR Changes Relating to Interim Ground Water Cleanup Levels From the ROD

Contaminant of Concern	Interim Cleanup Level (µg/L)	Original Basis	Revised Level	Revised Basis	Implication
Antimony	6	MCLG	--	--	None
Arsenic	50	MCL	10	MCL	More stringent
Barium	1,000	VT Std.	2,000	VT Std.	Less stringent
Benzene	5	MCL	--	--	None
Bis (2-chloroisopropyl ether)	1	Risk Based	--	--	None
Bis (3-ethylhexyl phthalate)	6	MCL	--	--	None
2-Butanone	170	VT Std.	4,200	VT Std.	Less stringent
Chromium	50	VT Std.	100	VT Std.	Less stringent
Lead	20	VT Std.	15	VT Std.	More stringent
Manganese	180	Risk Based	840	VT Std.	Less stringent
Methylene Chloride	5	MCL	--	--	None
Nickel	100	MCLG	Remanded 1995	VT Std.	Less stringent
Pentachlorophenol	1	MCL	--	--	None
Tetrachloroethylene	0.7	VT Std.	5	VT Std.	Less stringent
Trichloroethylene	5	MCL	--	--	None
Vinyl Chloride	2	MCL	--	--	None
Xylene	400	VT Std.	10,000	VT Std.	Less stringent

-- No revision has occurred.

Remedial Action Objectives

The Remedial Action Objectives for the remedy as stated in the ROD (listed in section 4.1) are still appropriate.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. From all of the activities conducted as part of this five-year review, no new information has come to light which would call into question the protectiveness of the remedy. No new human or ecological receptors have been identified at this time. No evidence of significant damage due to natural disasters or lack of maintenance was noted during the site inspection. The cleanup level for arsenic will need to be lowered to the level of the new MCL prior to completion of the cleanup action. The new arsenic MCL may impact the time period required for cleanup, but it does not affect the protectiveness of the remedy since there is no current use of the groundwater.

8.0 ISSUES

Several minor issues were identified as a result of this five year review. The MCL for arsenic was lowered from 50 ug/l to 10 ug/l in the year 2006. However because there is no route of exposure, this change does not impact human health or the environment. Some minor operation and maintenance items were identified in the 2009 Site Inspection (See Appendix D). These items will be timely addressed by the PRPs and do not affect the protectiveness of the remedy. EPA and Vermont ANR will continue to

perform periodic inspections to indicate areas where maintenance may be necessary. The new arsenic MCL will be considered when evaluating the long-term cleanup of the groundwater. A review of the natural restoration component of the remedy will be conducted as part of the next five year review.

This Five-Year Review has identified several issues listed in Table 8-1.

Table 8-1. Issues at the BFI Landfill Rockingham Superfund Site, Rockingham, Vermont.

Issues	Affects Current Protectiveness	Affects Future Protectiveness
The MCL for arsenic was lowered from 50 ug/l to 10 ug/l in the year 2006.	No	No
Some minor operation and maintenance items were identified in the 2009 Site Inspection (See Appendix D). These items will be timely addressed by the PRPs and do not affect the protectiveness of the remedy.	No	No

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The new arsenic MCL will be considered when evaluating the long-term cleanup of the groundwater. In addition, follow-up actions involve the continued oversight of the work being performed by the PRPs to assure compliance with the consent decree and Record of Decision requirements. Some minor operation and maintenance items have been identified during the 2009 Site inspection (Appendix D). These items will be timely addressed by the PRPs and do not affect the protectiveness of the remedy.

Table 9-1. Recommendations and Follow-up Actions for the BFI Rockingham Landfill Superfund Site, Rockingham, Vermont.

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
The MCL for arsenic was lowered from 50 ug/l to 10 ug/l in the year 2006.	The new arsenic MCL will be considered when evaluating the long-term cleanup of the groundwater.	EPA	EPA	2014	No	No
Some minor operation and maintenance items have been identified during the 2009 Site inspection (Appendix D).	The PRPs will continue to make O&M repairs as necessary in a timely fashion.	PRPs	EPA	2014	No	No

10.0 PROTECTIVENESS STATEMENT

The remedy is considered to be protective of human health and the environment in the short-term and long-term. Short-term protectiveness is achieved because:

- There is no current exposure of Site related waste to humans or the environment at levels that would represent a health concern.
- The landfill cover system prevents exposure to the waste material and contaminants in the landfill.
- The private water line has eliminated groundwater use within the area impacted by the landfill. The small quantity of contaminated groundwater that may be reaching the Connecticut River is rapidly diluted by the flow.
- Landfill gas is collected and treated by the extraction system and enclosed ground flare.
- The land use restriction prevents any use of the land that would result in an exposure to hazardous substances, pollutants, or contaminants.

The long-term protectiveness will be accomplished through continued performance of operation, maintenance, and monitoring activities along with the eventual restoration of the groundwater. The new arsenic MCL will be considered when evaluating the long-term cleanup of the groundwater.

11.0 NEXT REVIEW

The next five-year review will be completed by September 2014.

12.0 REFERENCES

- Balsam, 1993, Disposal Specialists, Inc. Site, Remedial Investigation Report, Rockingham, Vermont: Balsam Environmental Consultants, Inc.
- Balsam, 1994, Supplemental Remedial Investigation Report, Disposal Specialists, Inc., Landfill, Rockingham Vermont: Balsam Environmental Consultants, Inc.
- Dames & Moore, 1994, Long-Term Monitoring Plan, Disposal Specialists, Inc. Site, Rockingham, Vermont.
- EPA, 1994, Record of Decision summary for the BFI-Rockingham Landfill Superfund Site, September 1994
- EPA, 2001, Comprehensive Five-Year Review Guidance. EPA-540-R-01-007, prepared by the Office of Emergency and Remedial Response (5204G), USEPA, Washington DC, June 2001.
- EPA, 2004, Five Year Review Report for BFI-Rockingham Landfill Superfund Site, Rockingham, Vermont.
- URS, 2008, Spring 2008 semi-annual monitoring report, Disposal Specialists, Inc. Landfill, Rockingham, Vermont: prepared for Browning-Ferris Industries.
- URS, 2008a, Class IV Groundwater Reclassification Petition, Disposal Specialists, Inc., Landfill, Rockingham, Vermont
- URS, 2009, Fall 2008 semi-annual monitoring report, Disposal Specialists, Inc. Landfill, Rockingham, Vermont: prepared for Browning-Ferris Industries.
- VHB Pioneer, 2008, Town of Rockingham, Aquifer recharge areas study, final study report: Prepared for the Town of Rockingham, Vermont, by VHB Pioneer Environmental Associates.
- Vermont Agency of Natural Resources and Vermont Groundwater Coordinating Committee, 2009 Findings of Fact & Reclassification Order, Proposed Groundwater Reclassification at the DSI Landfill, Rockingham, Vermont, signed by Jonathan Wood, Secretary, Agency of Natural Resources, April 16, 2009.

APPENDIX A – FIGURES

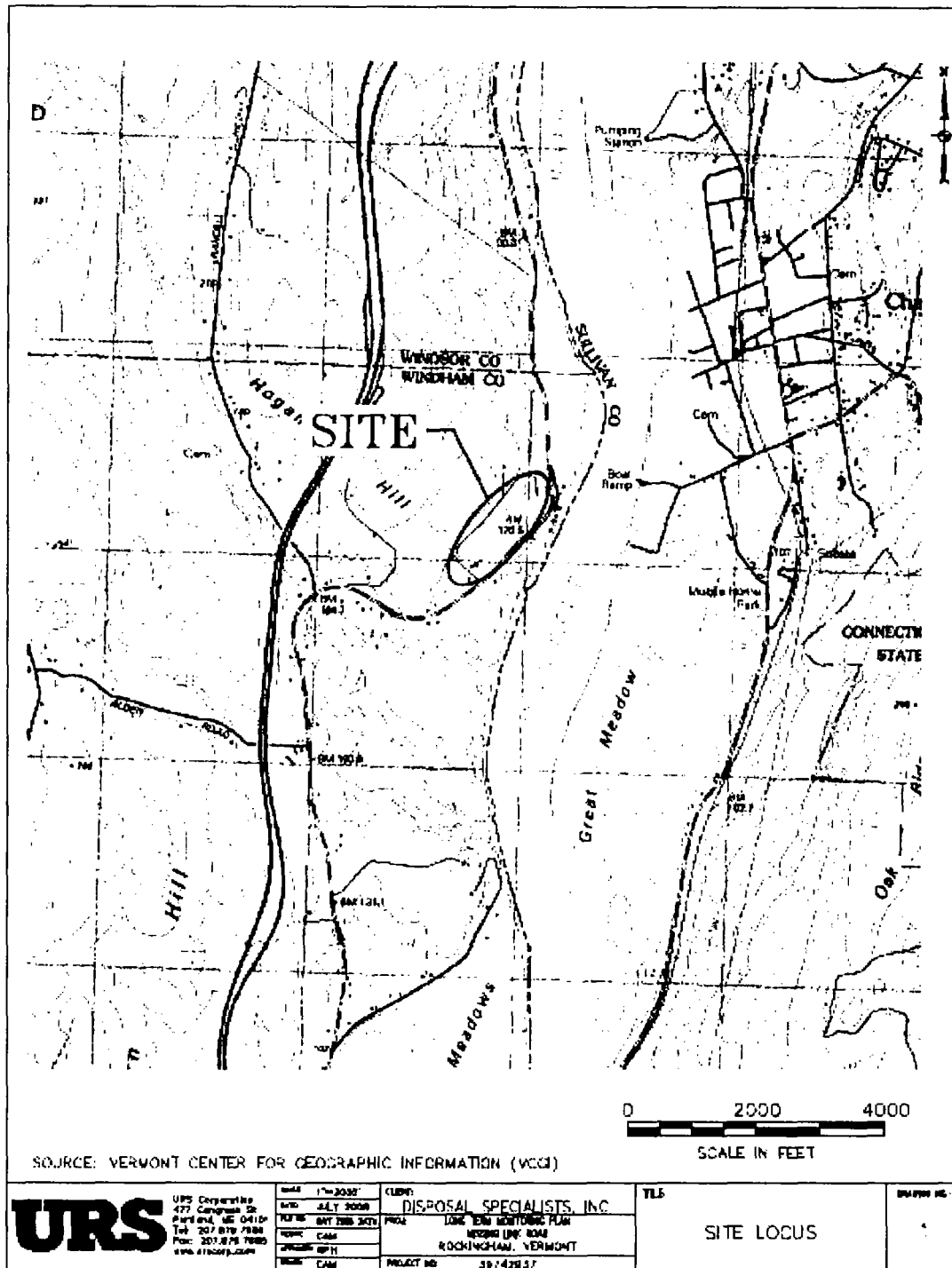
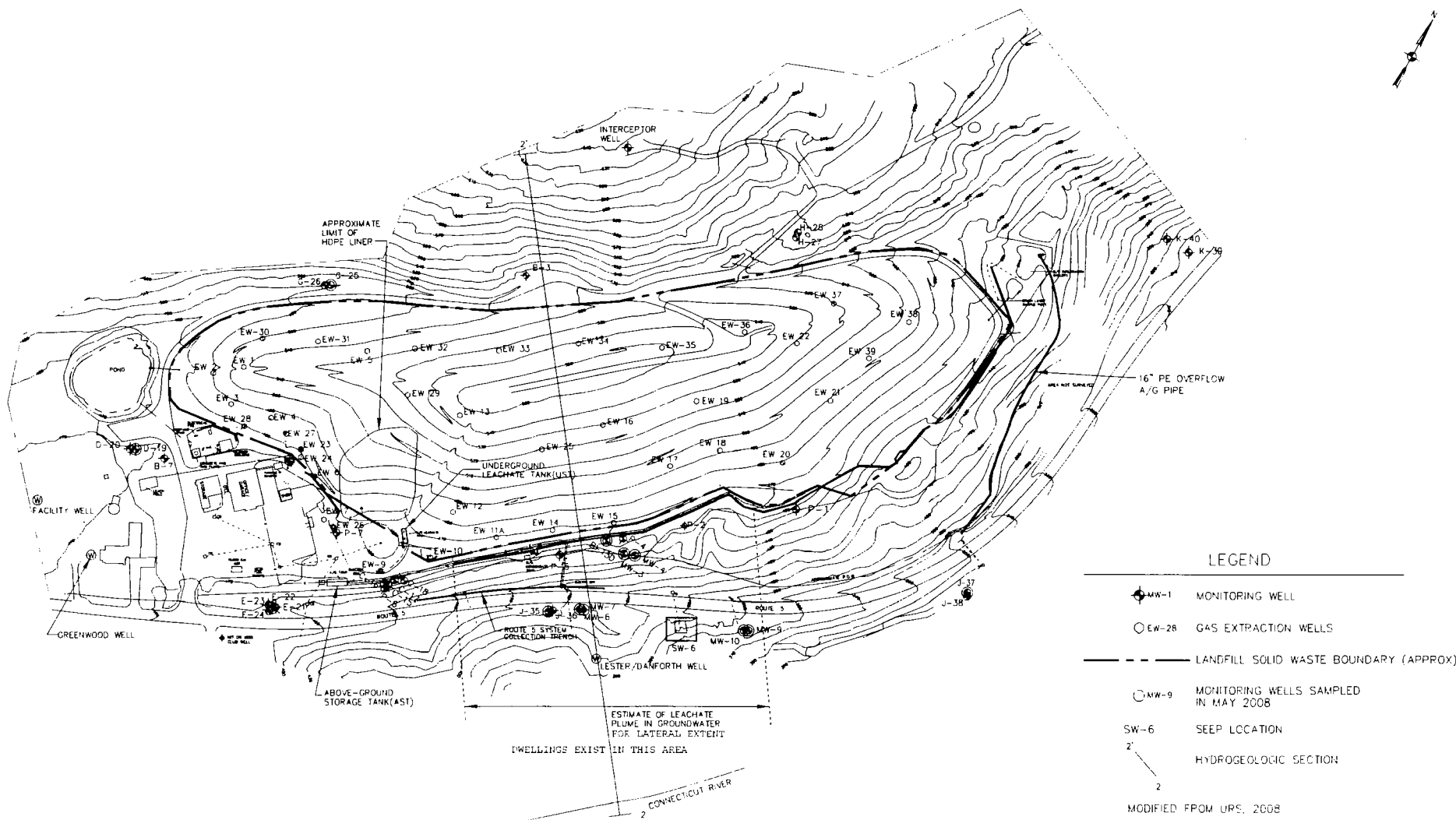


Figure 1. Location of BFI Rockingham Landfill Site, Rockingham, Vermont

Figure 2. Site Plan, BFI-Rockingham Landfill Site, Rockingham, Vermont



LEGEND

- MW-1 MONITORING WELL
- EW-28 GAS EXTRACTION WELLS
- LANDFILL SOLID WASTE BOUNDARY (APPROX)
- MW-9 MONITORING WELLS SAMPLED IN MAY 2008
- SW-6 SEEP LOCATION
- HYDROGEOLOGIC SECTION
- MODIFIED FROM URS, 2008

URS

URS Corporation
475 Congress Street, Suite 900
Portland, ME 04101-3453
Tel: 207.679.1686
Fax: 207.679.7685
www.urscorp.com

0 200 400
SCALE IN FEET

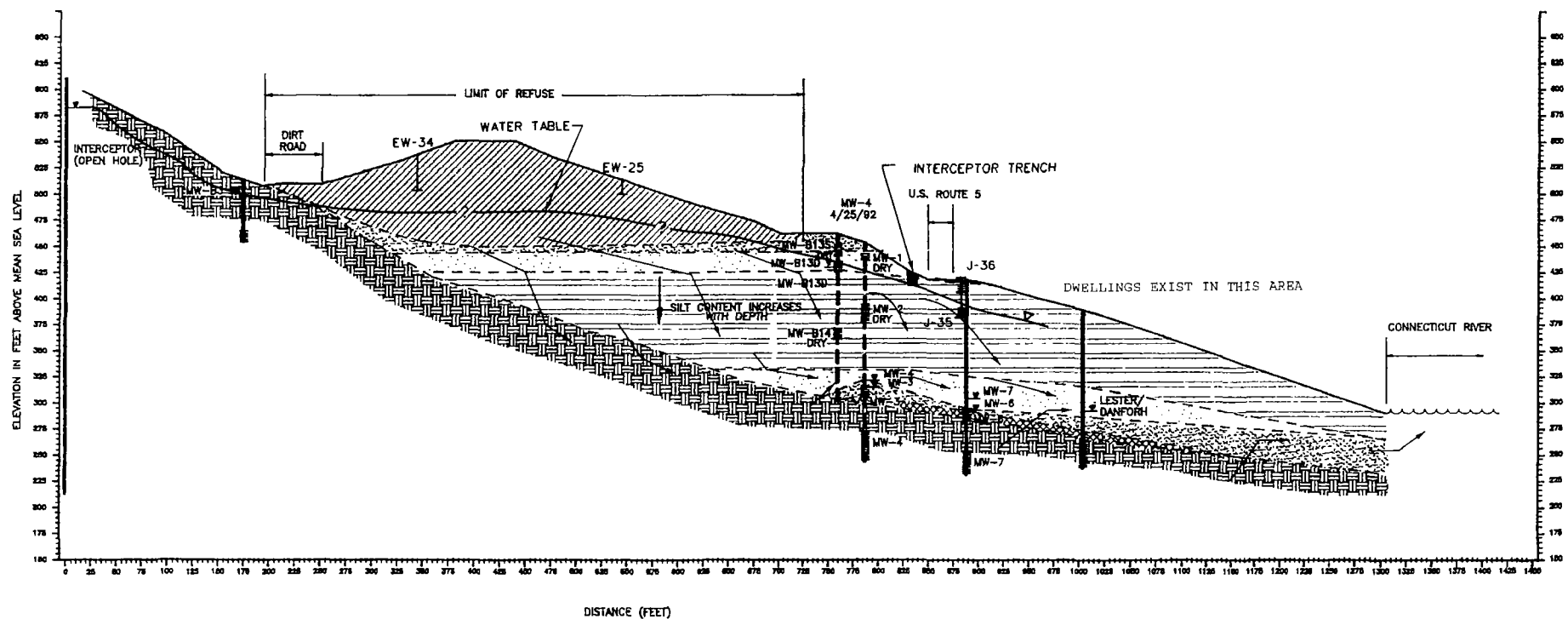
PROJECT NO	39742937
DESIGN	WPH
APPROVED	JSH
DRAWN	CAM
SCALE	1" = 200'
DATE	JULY 2008
FILE NO	MAY 2008 DATA

CLIENT	DISPOSAL SPECIALISTS, INC
PROJECT	LONG TERM MONITORING PLAN MISSING LINK ROAD ROCKINGHAM, VERMONT

SITE PLAN

FIGURE NO
2

Figure 3. Geologic section showing conceptual groundwater flow patterns and likely vertical extent of landfill-affected groundwater, BFI Rockingham Landfill Site, Rockingham, Vermont.



LEGEND:

- = REFUSE
- = SAND
- = SILT WITH SAND (VARVED LACUSTRINE)
- = CLAYEY SILT (VARVED LACUSTRINE)
- = ROCK FRAGMENTS AND SILT (BASAL TILL)
- = BEDROCK

= WATER LEVELS MEASURED 3/30/92

= SCREENED INTERVAL

= PROJECTED MONITORING WELL DISTANCE > 50 FEET FROM CROSS-SECTION LINE

= CONCEPTUAL GROUND WATER FLOW PATHS

NOTES:

1. STRATIGRAPHY BASED ON LIMITED SUBSURFACE DATA COLLECTED FROM BORINGS ADVANCED FROM 1877 THROUGH 1992. IN ADDITION, SEVERAL PRIVATE RESIDENTIAL WELL LOGS WERE INCLUDED.
2. WELLS SHOWN ON SECTION LINE BUT NOT ON FIGURE HAVE BEEN DESTROYED, COVERED OR TAKEN OUT OF SERVICE.
3. MODIFIED FROM BALSAM (1994)

		CLIENT: DISPOSAL SPECIALISTS, INC.	
		PROJECT: DSI RI	
TITLE: INTERPRETATIVE CROSS-SECTION 2-2'			
DESIGNED BY: M.M.J.	DRAWN BY: P.J.S.	CHECKED BY: M.A.D.	APPROVED BY: L.C.S.
SCALE: As Shown	DATE: 4/15/93	FILE NO: 100 645830B	PROJECT NO: 6458
			3-4

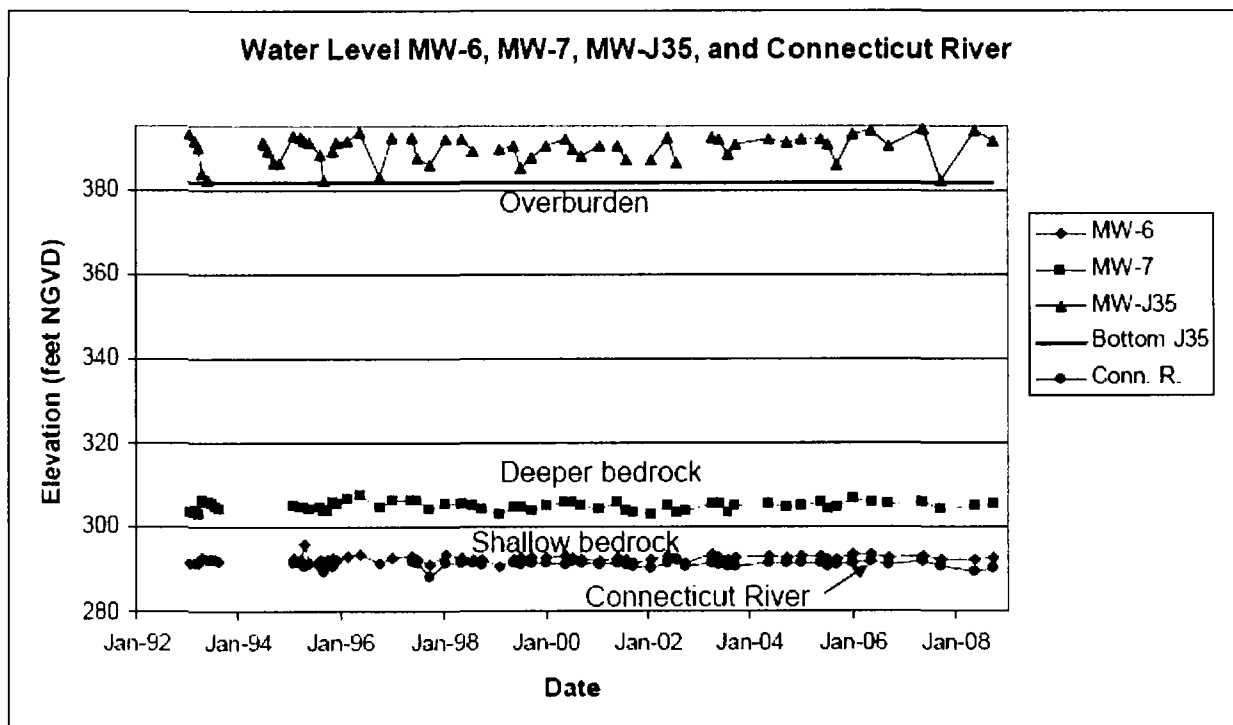
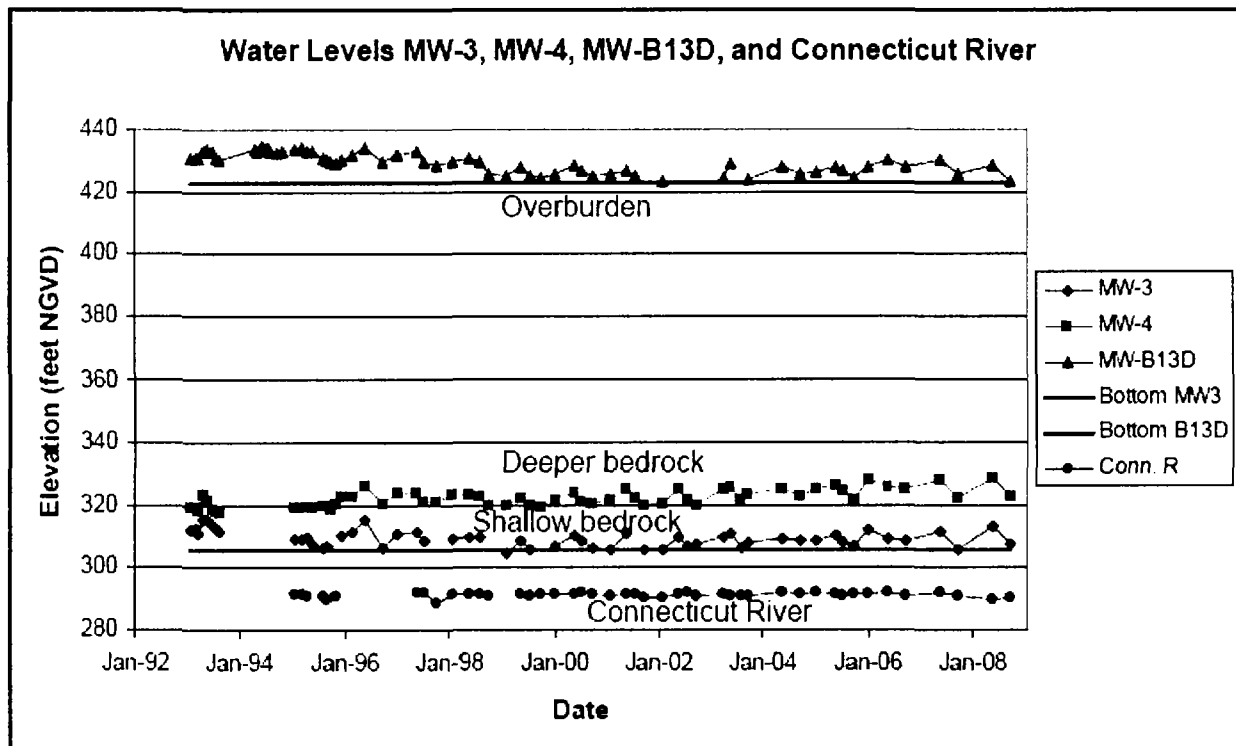


Figure 4. Water-level hydrographs for selected wells and the Connecticut River, BFI Rockingham Landfill Site, Rockingham, Vermont.

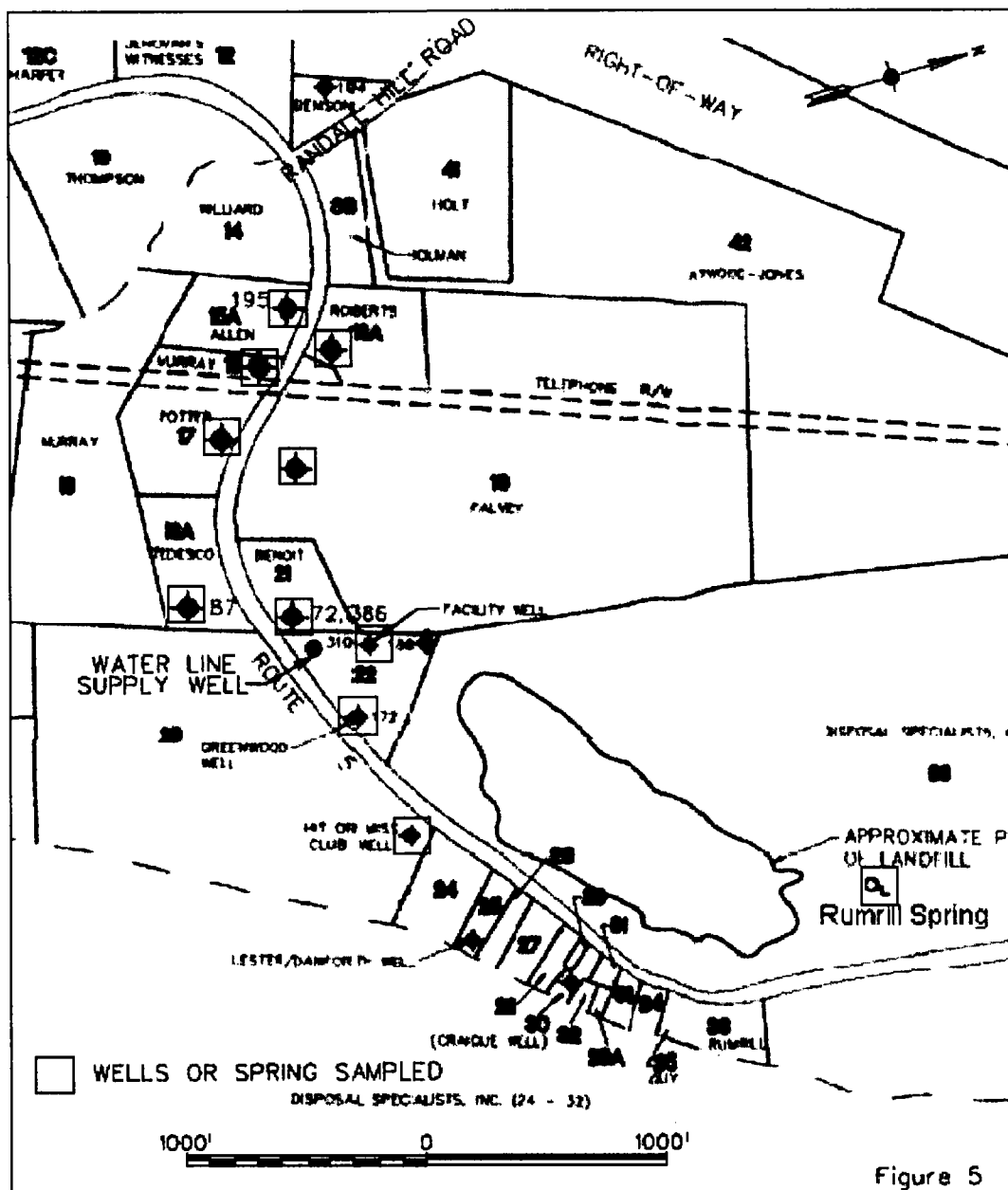
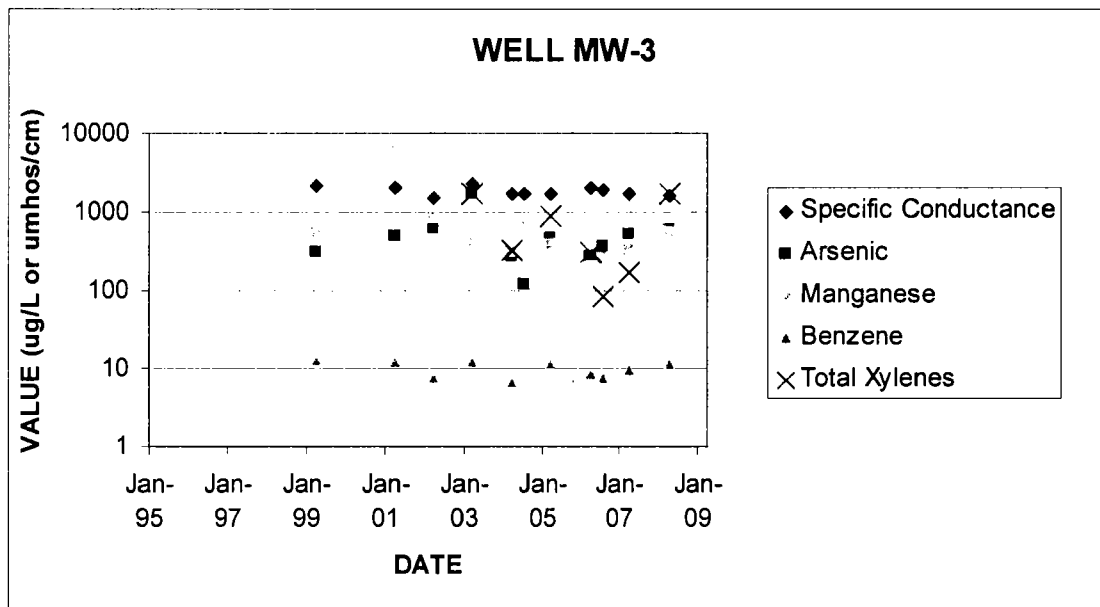


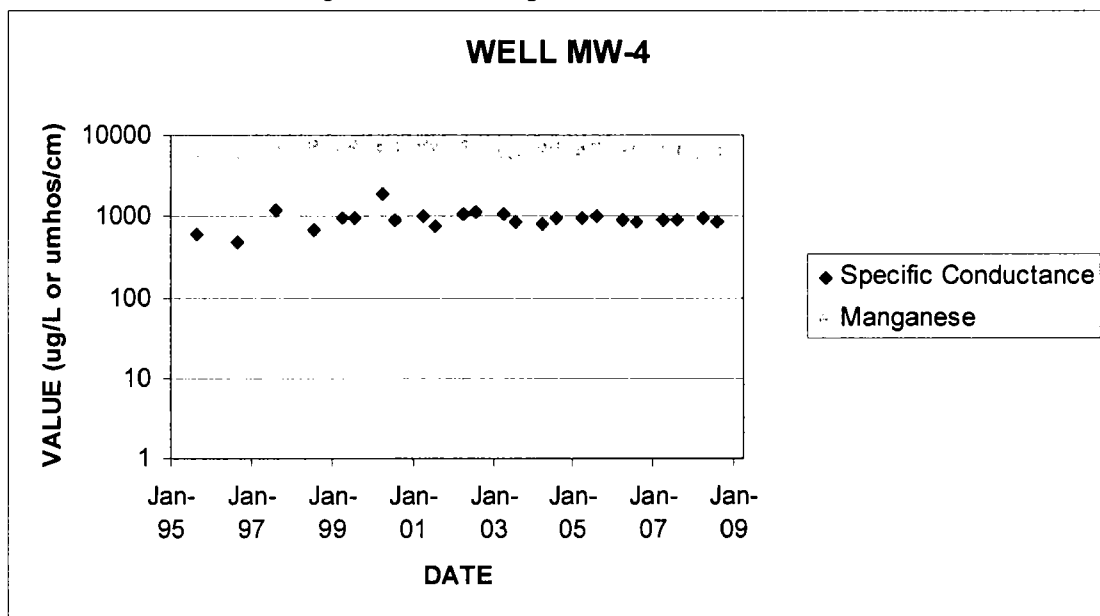
Figure 5. Locations of residential wells and a spring sampled periodically near the BFI Rockingham Landfill Site, Rockingham, Vermont (modified from Balsam, 1994).

Figure 6a to 6g. Specific conductance and concentrations of contaminants in bedrock wells, BFI Rockingham Landfill Site, Rockingham, Vermont (modified from Balsam, 1994).

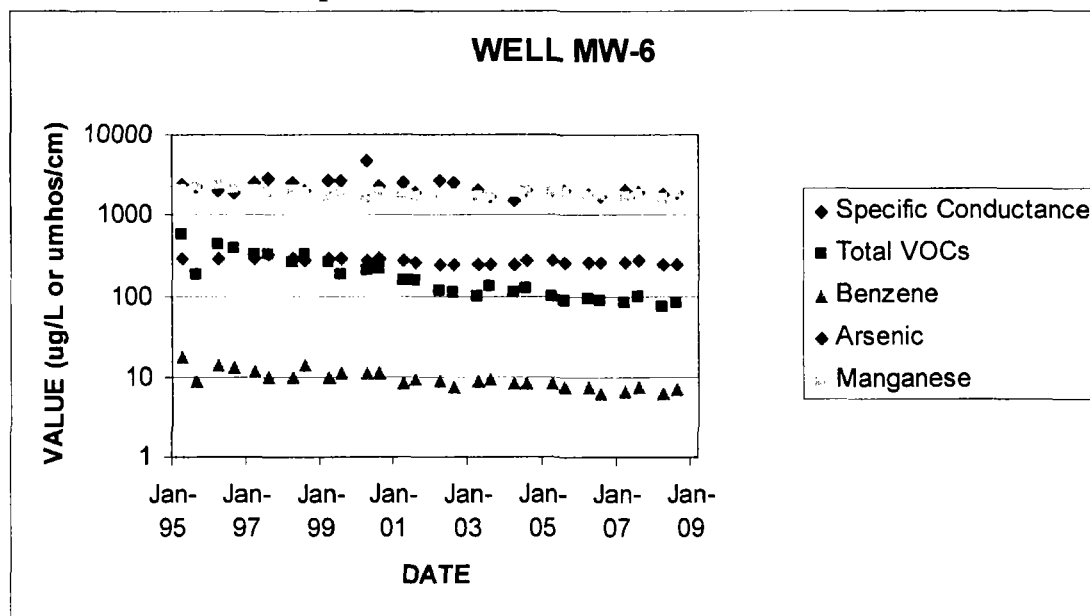
6a. Well MW-3 completed in shallow bedrock.



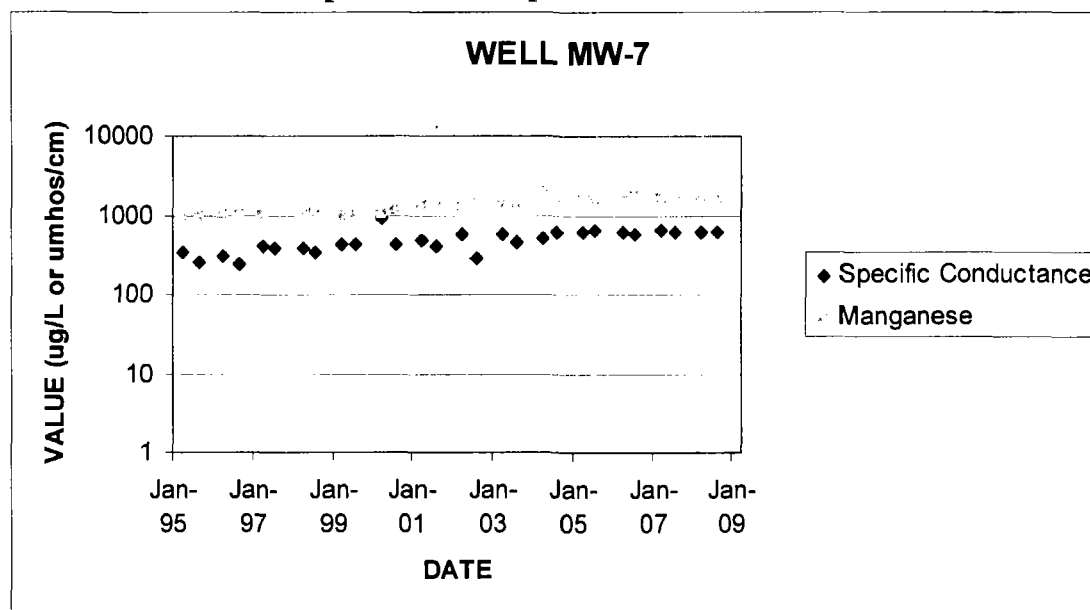
6b. Well MW-4 completed in deeper bedrock.



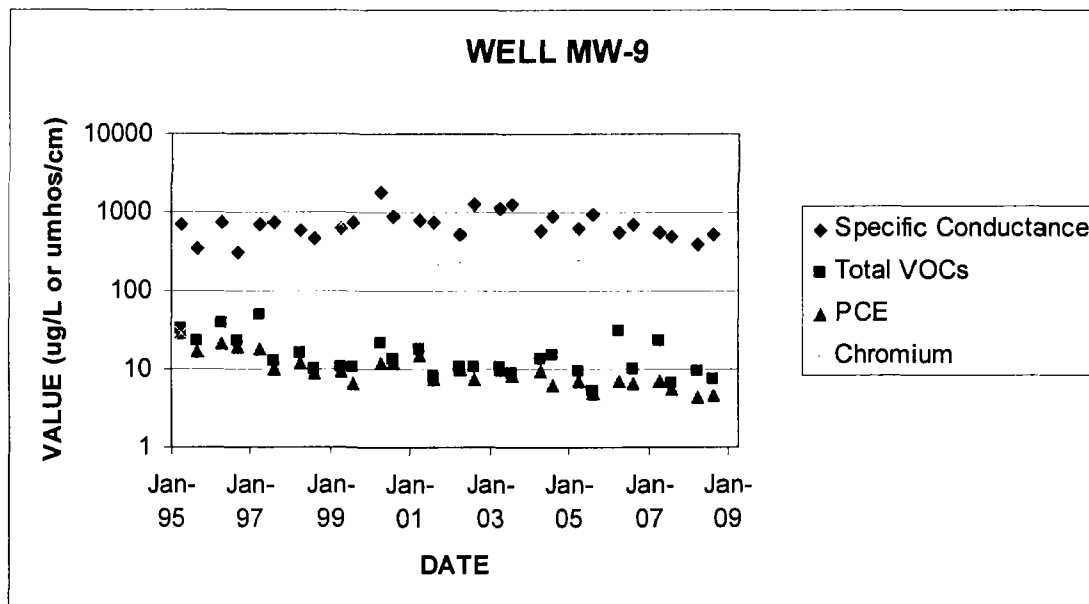
6c. Well MW-6 completed in shallow bedrock.



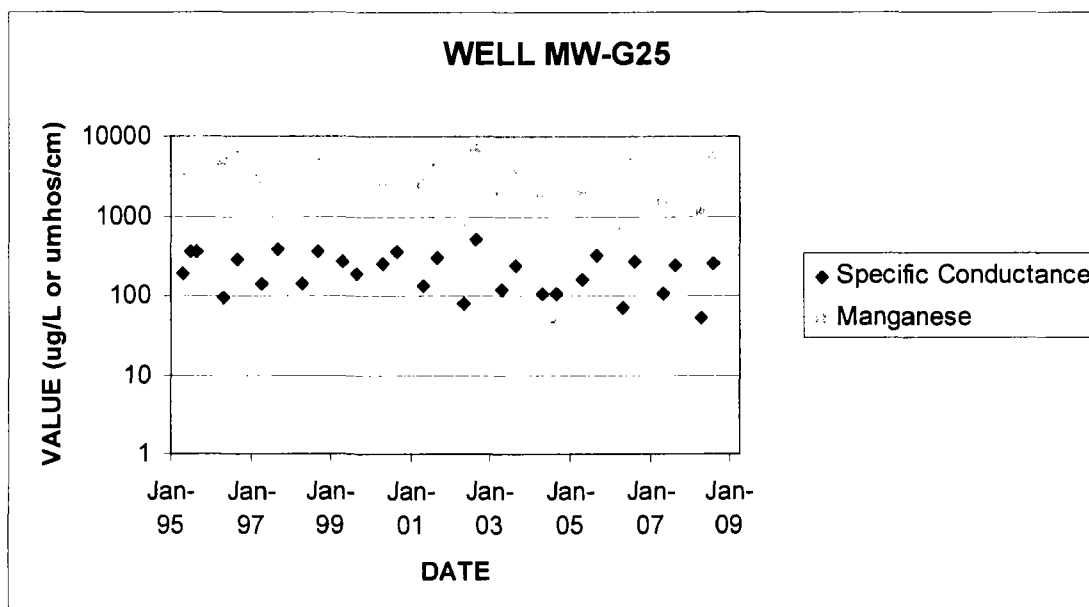
6d. Well MW-7 completed in deeper bedrock.



6e. Well MW-9 completed in shallow bedrock.



6f. Well MW-G25 completed in shallow bedrock.



6g. Well MW-J37 completed in shallow bedrock

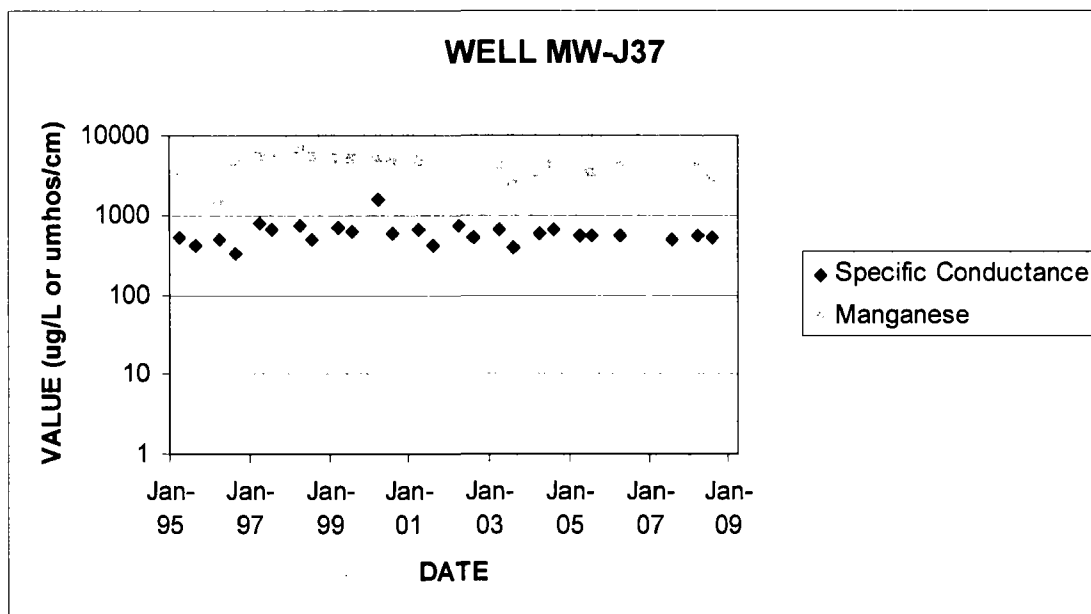
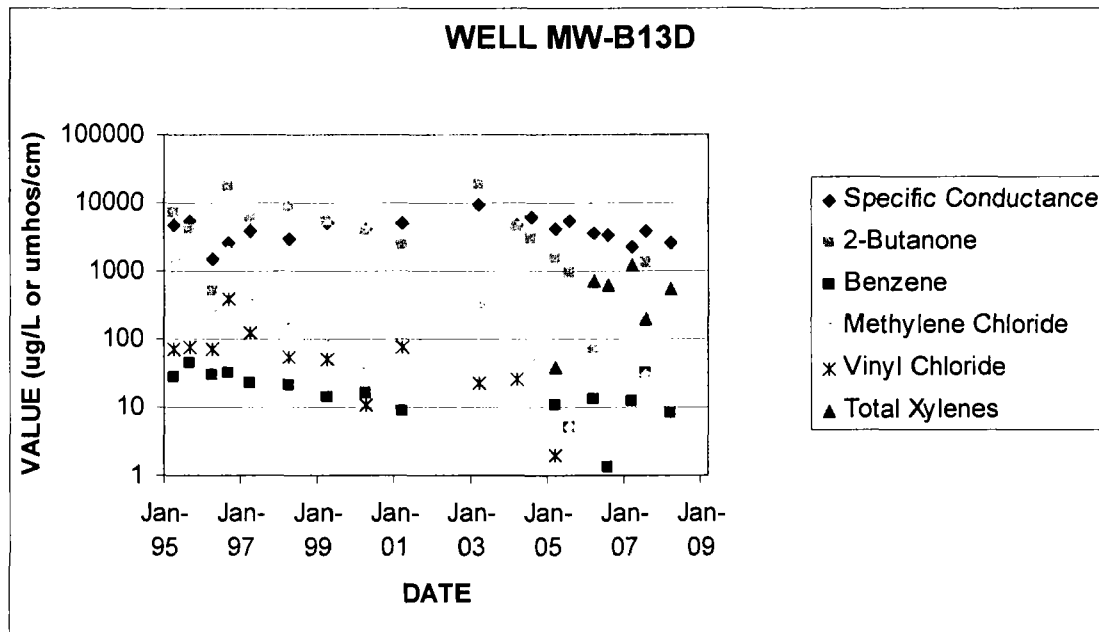
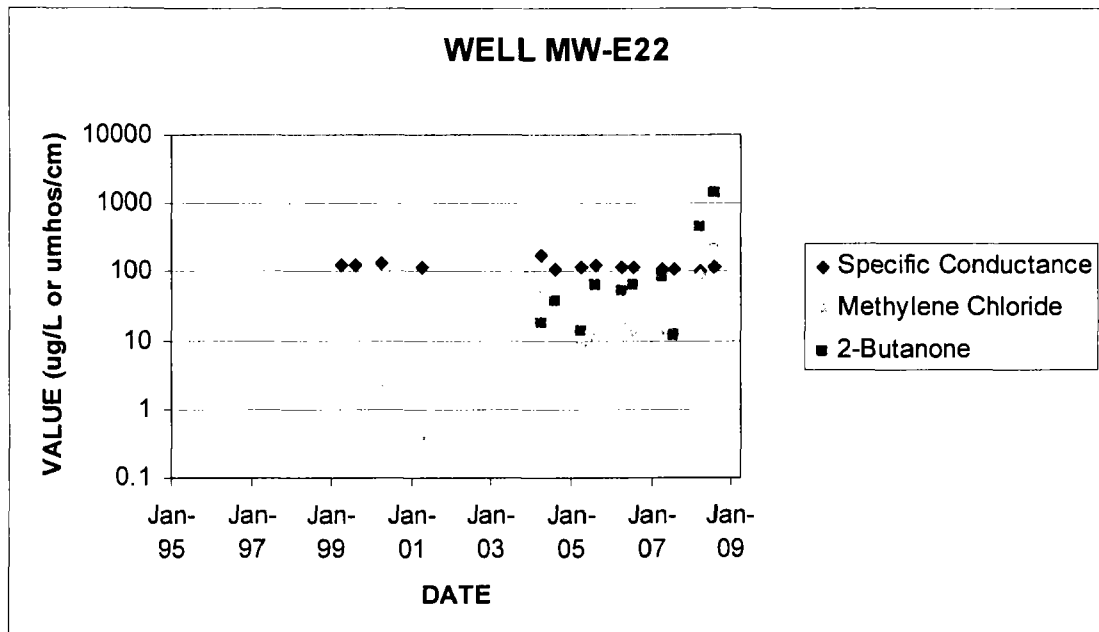


Figure 7a to 7c. Specific conductance and concentrations of selected contaminants in overburden wells, BFI Rockingham Landfill Site, Rockingham, Vermont.

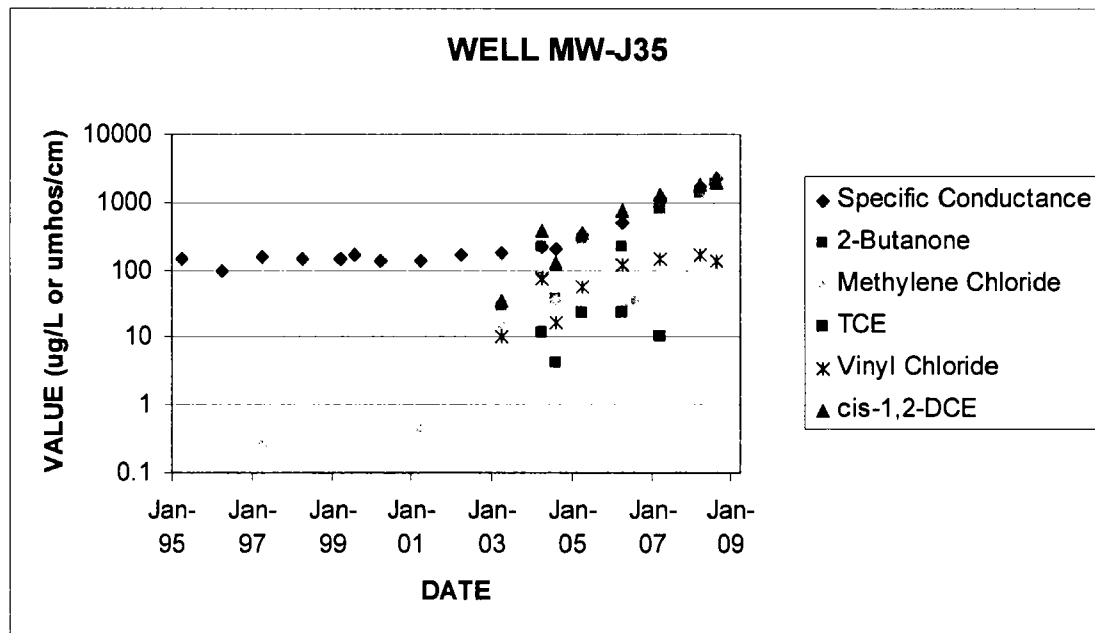
7a. Well MW-B13D completed in overburden.



7b. Well MW-E22 completed in overburden



7c. Well MW-J35 completed in overburden.



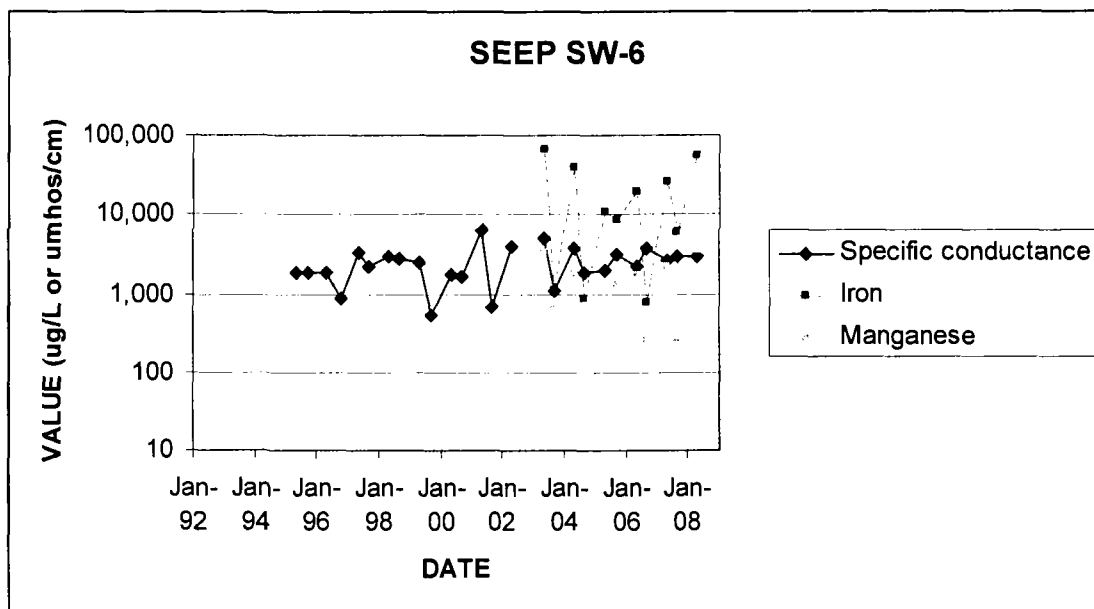


Figure 8. Specific conductance, iron, and manganese concentrations in seep SW-6, BFI Rockingham Landfill Site, Rockingham, Vermont.

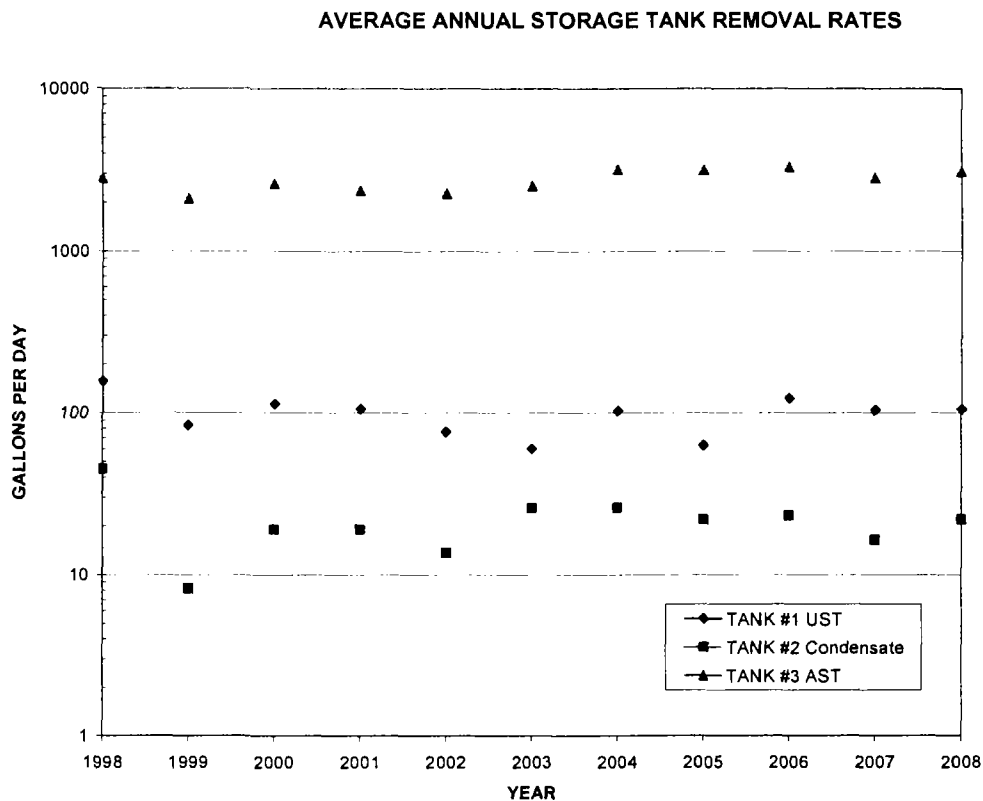


Figure 9. Flow rates to above-ground (AST), underground (UST), and condensate storage tanks, BFI Rockingham Landfill Site, Rockingham, Vermont.

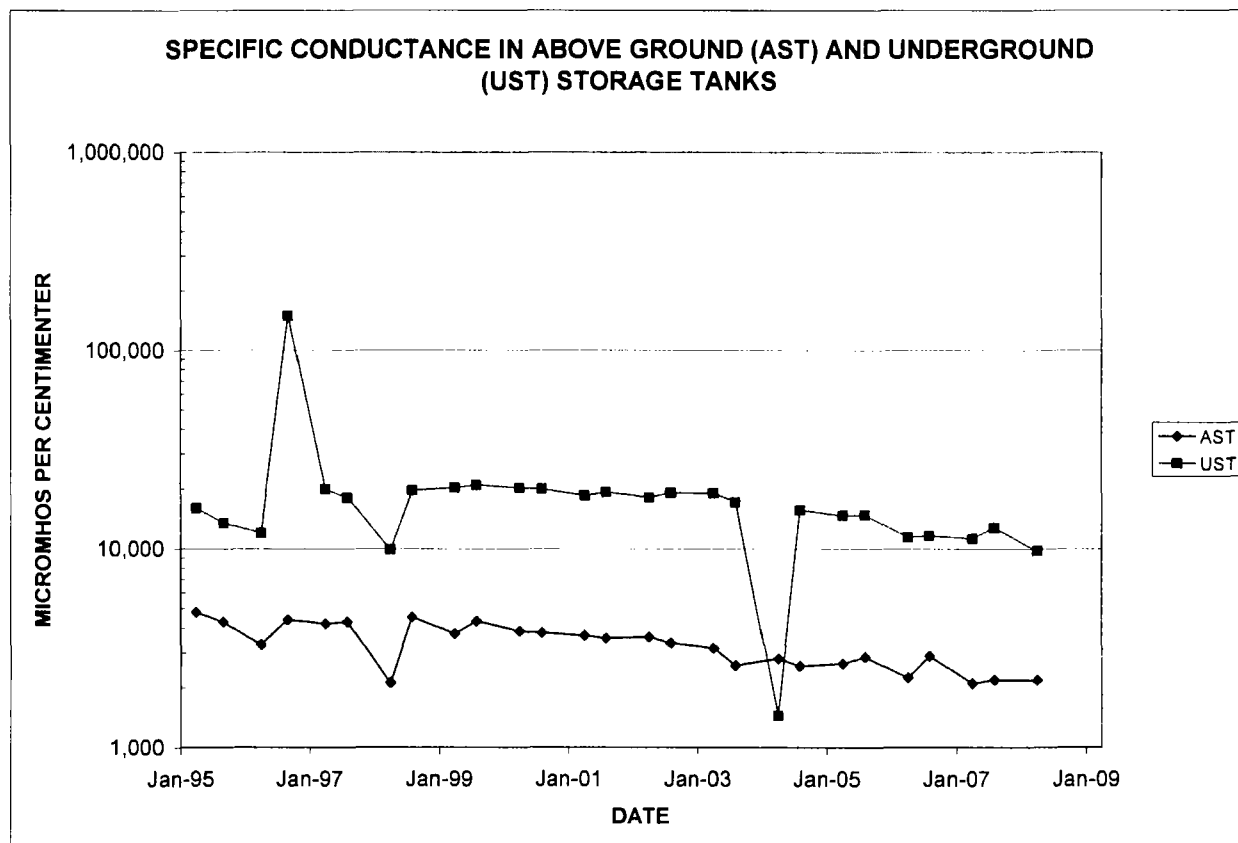


Figure 10. Specific conductance in above-ground (AST) and underground (UST) storage tanks, BFI Rockingham Landfill Site, Rockingham, Vermont.

APPENDIX B – GRANT OF ENVIRONMENTAL RESTRICTIONS AND RIGHT OF ACCESS

Superfund Records Center

SITE: PA 1BREAK: 1-4OTHER: 200-2-0**GRANT OF ENVIRONMENTAL RESTRICTIONS AND RIGHT OF ACCESS**

THIS AGREEMENT is made this 4th day of June, 1996, by DISPOSAL SPECIALISTS, INC., a corporation organized and existing under the laws of the State of Vermont and having its principal place of business in Rockingham, in the County of Windham (hereinafter referred to as "Grantor") and the SECRETARY OF THE STATE OF VERMONT AGENCY OF NATURAL RESOURCES (hereinafter referred to as the "Grantee");

WITNESSETH THAT:

WHEREAS, Grantor is the legal title holder in fee simple of certain real property parcels situated in Rockingham, County of Windham, State of Vermont, more particularly depicted in Exhibit A and described as follows:

PARCEL 1: Property situated on the easterly side of U.S. Route #5, so-called, as more particularly described in an Administrator's Deed of Mary A. Ryan, Administratrix of the Estate of Walter J. Asonevich to Disposal Specialists, Inc. which said deed is dated January 24, 1980 and is recorded in Book 182, Page 564 of the Rockingham Land Records;

PARCEL 2: Property situated on the easterly side of U.S. Route #5, so-called, as more particularly described in a Warranty Deed from George E. Lennon and Susan F. Lennon to Disposal Specialists, Inc. which said deed is dated March 29, 1980 and is recorded in Book 185, Page 19 of the Rockingham Land Records;

PARCEL 3: Property situated on the easterly side of U.S. Route #5, so-called, as more particularly described in a Warranty Deed from Frank Y. Cowen to Disposal Specialist, Inc. which said deed is dated November 9, 1979 and is recorded in Book 182, Page 547 of the Rockingham Land Records;

PARCEL 4: Property situated on the easterly side of U.S. Route #5, so-called, as more particularly described in a Warranty Deed from Lawrence G. and Alice A. Cheeseman to Disposal Specialists, Inc. which said deed is dated March 19, 1980 and is recorded in Book 185, Page 4 of the Rockingham Land Records;

PARCEL 5: Property situated on the easterly side of U.S. Route #5, so-called, as more particularly described in a Warranty Deed from Albert L. Craigue and Alice P. Craigue to Disposal Specialists, Inc. dated April 9, 1980 and recorded in Book 185, Page 21 of the Rockingham Land Records;

PARCEL 6: Property situated on the easterly side of U.S. Route #5, so-called, as more particularly described in a Warranty Deed from Albert L. Craigue and Alice P. Craigue to Disposal Specialists, Inc. dated April 9, 1980 and recorded in Book 185, Page 26 of the Rockingham Land Records;

TOWN CLERK'S OFFICE
Rockingham, VT 05101

Received June 26, 19964:20 P. M.Recorded in Book 236 Page 340-355John B. Aldrich

Environmental Restrictions
Page 2 of 15

PARCEL 7: Being a parcel of land on the westerly side of U.S. Route #5, so-called, consisting of approximately 23 acres, more or less, whereon the former DSI/BFI Rockingham Landfill (also known as the BFI-Rockingham Landfill) is situated, said 23 acres being more particularly described as beginning at a point on the westerly side of U.S. Route #5, which said point marks the southeasterly corner of the parcel herein described; thence proceeding in a generally northerly direction along the westerly side of U.S. Route #5 a distance of approximately 2375 feet, more or less, to a point; thence turning and proceeding in a generally westerly direction a distance of approximately 437.5 feet, more or less, to a point; thence turning and proceeding in a generally southwesterly direction distance of approximately 1812.5 feet, more or less, to a point in the boundary line of premises now or formerly of Falvey; thence turning and proceeding along said Falvey line a distance of approximately 250 feet, more or less, to a point; thence turning and proceeding along other lands of DSI in a generally easterly direction a distance of 594 feet, more or less, to the point and place of beginning. The herein described parcel is a PORTION ONLY of the lands and premises conveyed to Disposal Specialists, Inc. by Quitclaim Deed of Harry K. Shepard, Inc. which said deed is dated May 28, 1969 and is recorded in Book 166, Page 60 of the Rockingham Land Records;

WHEREAS, Parcels 1 through 7 hereinabove described, in whole or in part, are part of the BFI-Rockingham Landfill Superfund Site (the "Site"). The Site consists of a 17-acre solid waste landfill and the surrounding areas impacted by the release of hazardous substances, pollutants or contaminants from the Landfill. The Site is the subject of a response action by the United States Environmental Protection Agency ("EPA"), a duly constituted agency organized under the laws of the United States of America, pursuant to the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), as amended, 42 U.S.C. § 9601 *et seq.* and the National Contingency Plan ("NCP"), 40 C.F.R. 300.400 *et seq.* and by the Vermont Department of Environmental Conservation ("VT DEC"), a duly constituted department of the Vermont Agency of Natural Resources organized under the laws of the State of Vermont (the "State") pursuant to 10 V.S.A. §6615. For the purpose of this Grant of Environmental Restrictions and Right of Access, the relevant portion of Parcel 7 being affected by this Grant is more particularly shown on as the "Capped Area" in Exhibit A attached hereto and made a part hereof. Parcels 1 through 6 hereinabove described are hereinafter described as "Properties" for purposes of this Grant of Environmental Restrictions and Right of Access (hereinafter "Grant");

WHEREAS, pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the Site on the National Priorities List, set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on October 4, 1989, 54 Fed. Reg. 41020;

WHEREAS, in an Action Memorandum dated September 13, 1993, the EPA Regional Administrator selected a non-time critical removal action (the "Removal Action") for the Site.

Environmental Restrictions
Page 3 of 15

WHEREAS, under the terms of the Administrative Order by Consent for Removal Action, U.S. EPA Region I CERCLA Docket No. I-93-1099 ("Administrative Order"), entered into, by and between Grantor and EPA on September 24, 1993, Grantor agreed to perform the Removal Action identified in the Action Memorandum in order to protect the public health and welfare and the environment from the actual or threatened release of hazardous substances at or from the Site;

WHEREAS, under the terms of a Consent Decree, U.S. EPA Region I CERCLA Docket No. _____ ("Consent Decree"), entered into, by and between the Grantor, EPA and the State on _____, Grantor has agreed to perform the Remedial Action identified in the Record of Decision signed by the Administrator on September 21, 1994, in order to protect the public health and welfare and the environment from the actual or threatened release of hazardous wastes or hazardous substances at or from the Site. Under the terms of the Consent Decree, Grantor has agreed to perform, among other obligations, the following activities;

1. continued maintenance of the multi-layer cap;
2. continued operation and maintenance of the existing leachate collection system and groundwater collection trench;
3. continued operation and maintenance of the gas collection and treatment system;
4. implementation and maintenance of institutional controls: to prevent future use of the landfill that would damage the multi-layer cap; to prevent groundwater use throughout the area of Site-related contamination; to amend the Water Agreement pursuant to the Statement of Work ("SOW"); and
5. continued long-term monitoring of the seeps, groundwater, collected groundwater and leachate, Connecticut River surface water, residential wells, and storm water run-off at the Site to confirm the nature and extent of contamination and confirm the restoration of the groundwater.

A copy of the Administrative Order and the Consent Decree are available from:

Office of Environmental Stewardship
United States Environmental Protection Agency
JFK Federal Building - RCA
Boston, MA 02203
Attention: BFI-Rockingham Landfill Superfund Site
Region I CERCLA Docket No. I-93-1099
Region I CERCLA Docket No. I-_____;

Environmental Restrictions
Page 4 of 15

WHEREAS, the United States has determined that certain easements, rights, obligations, covenants and restrictions, as more particularly set forth below, are necessary at certain portions of the Site to conduct and maintain the integrity and effectiveness of the Removal Action and the Remedial Action;

WHEREAS, the VT DEC Commissioner has determined that this Grant is consistent with the purposes and requirements of 10 V.S.A. chapter 159 because the easements, rights, obligations, covenants and restrictions set forth below will effectively protect public health and the environment from the hazards of pollution originating from the Site; and

WHEREAS, the Grantor agrees to grant the aforesaid easements, rights, obligations, covenants, and restrictions, as more particularly set forth below to the Grantee pursuant to the Consent Decree;

NOW, THEREFORE, in consideration of the agreements reached in the Administrative Order and the Consent Decree, Grantor hereby grants to the Grantee and its assigns, including the EPA, with WARRANTY COVENANTS, the easements, rights, obligations, covenants, and restrictions (hereinafter, collectively referred to as the "Environmental Restrictions"), the terms and conditions of which are as follows:

1. Right of Access.

- a. In establishing the within Environmental Restrictions, Grantor hereby grants to the Grantee and its assigns, including EPA, a perpetual right of access (I) in, on, upon, through, over and under the portion of Parcel 7 described above and (ii) to pass and repass over the Site, on the portion of Parcel 7 described above, for the following purposes:
 - i. Monitoring the Removal Action and the Remedial Action, including Operation and Maintenance of the Remedial Action;
 - ii. Verifying any data or information submitted to the United States and the State;
 - iii. Conducting investigations relating to contamination at or near the Site;
 - iv. Obtaining samples;
 - v. Monitoring the groundwater, surface water or air;
 - vi. Assessing the need for, planning, or implementing additional response actions at or near the Site;

Environmental Restrictions
Page 5 of 15

- vii. Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Settling Defendants or their agents, consistent with Section XXV of the Consent Decree;
 - viii. Assessing Settling Defendants' compliance with the Administrative Order on Consent and the Consent Decree; and
 - ix. Conducting other investigations and response actions consistent with CERCLA, the NCP, and/or other applicable State or Federal environmental regulations, including, but not limited to, the performance of the Remedial Action by the State and/or EPA pursuant to Paragraph 100 of the Consent Decree.
- b. With respect to Parcels 1 through 6 (the "Properties") described above, Grantor hereby grants to the Grantee and its assigns, including EPA, a right of access (i) in, on, upon, through, over and under Parcels 1 through 6, and (ii) to pass and repass over Parcels 1 through 6, for the following purposes:
- i. Monitoring the Removal Action and the Remedial Action, including Operation and Maintenance of the Remedial Action;
 - ii. Verifying any data or information submitted to the United States and the State;
 - iii. Conducting investigations relating to contamination at or near the Site;
 - iv. Obtaining samples;
 - v. Monitoring the groundwater, surface water or air;
 - vi. Assessing the need for, planning, or implementing additional response actions at or near the Site;
 - vii. Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Settling Defendants or their agents, consistent with Section XXV of the Consent Decree;
 - viii. Assessing Settling Defendants' compliance with the Administrative Order on Consent and the Consent Decree; and
 - ix. Conducting other investigations and response actions consistent with CERCLA, the NCP, and/or other applicable State or Federal environmental

Environmental Restrictions
Page 6 of 15

regulations, including, but not limited to, the performance of the Remedial Action by the State and/or EPA pursuant to Paragraph 100 of the Consent Decree.

Grantee's right of access under this subparagraph, 1.b., shall expire 30 years from the recordation of this Grant, or sooner, provided that Grantor has petitioned the Grantee for amendment, modification, or release of this Grant upon submission of the Groundwater Completion Report, and such petition is approved by the Grantee, pursuant to Paragraph 13 below.

In the event that the Groundwater Completion Report to be submitted by Grantor under Paragraph 57.a of the Consent Decree is not approved within 30 years from the recordation date of this Grant, this Grant will automatically continue for an additional 30-year period, subject to the provisions of Paragraph 13 below.

2. Designation of Restricted Areas. The Environmental Restrictions shall apply, as set forth below in Paragraph 3, to the following three distinct areas:

A. The "Capped Area," e.g., that section of Parcel 7 which constitutes the cap, the leachate collection system, and the gas collection and treatment system, as identified in Exhibit A, attached hereto;

B. The "Groundwater Restriction Area," e.g., that section of the Site where remedial investigation sampling events have detected the presence of contaminants above the groundwater clean-up levels established by the Consent Decree. This area is identified in Exhibit B, attached hereto;

C. The "Waterline Restriction Area," e.g., that section of the Site where a certain drinking water well and waterline are located, and which said waterline serves certain residences, as identified in Exhibit B and in the 1983 "Water Agreement" and its amendments.

3. Restricted Uses and Activities. Grantor shall neither perform, nor suffer, allow or cause any other person to perform, any of the following activities or uses in, on, upon, through, over or under those portions of the Properties and Parcel 7 situated within the Capped Area, the Groundwater Restriction Area, and the Waterline Restriction Area:

A. The Capped Area. Except pursuant to a plan approved by the Grantee (and by EPA pursuant to the Consent Decree), and in accordance with the procedures set forth in subsection 3.E, below, no use shall be made which disturbs the integrity of any of the layers of the cap, the leachate collection system, the gas collection and treatment system, or any other structures for maintaining the effectiveness of the Removal Action and the Remedial Action, whether in place now or put in place in the future. Nor shall any use be made which disturbs the function of any necessary system for monitoring these structures. This

Environmental Restrictions
Page 7 of 15

restriction shall apply, without limitation, to all aspects of the cap and related structures identified in Exhibit A.

B. The Groundwater Restriction Area. Except pursuant to a plan approved by the Grantee (and by EPA pursuant to the Consent Decree), and in accordance with the procedures set forth in subsection 3.E below, groundwater within the Groundwater Restriction Area shall not be used in any manner, including, but not limited to, use as a drinking water supply. No groundwater wells shall be installed within the Groundwater Restriction Area except for purposes of groundwater monitoring pursuant to a plan approved by the Grantee and EPA.

C. The Waterline Restriction Area. Except pursuant to a plan approved by the Grantee (and by EPA pursuant to the Consent Decree), and in accordance with the procedures set forth in subsection 3.E below, the waterline (including the drinking water well and all structures and equipment related thereto) located in the Waterline Restriction Area shall not be altered or disturbed in any manner that permanently or temporarily discontinues or interrupts the provision of water from the waterline to the residential properties identified in Exhibit B attached hereto. This prohibition shall not apply to normal maintenance activities related to the waterline.

D. The Properties and Parcel 7. Except pursuant to a plan approved by the Grantee (and by EPA pursuant to the Consent Decree), and in accordance with the procedures set forth in subsection 3.E, below, no activity or use shall be conducted which disturbs the Removal Action and the Remedial Action, or any aspect thereof, whether now or in the future, including, without limitation: (1) systems and areas to collect and/or contain groundwater, surface water runoff, or leachate; (2) systems or containment areas to excavate, dewater, store, treat, and/or dispose of soils and sediments; and (3) systems and studies to provide long-term environmental monitoring of on-site groundwater, surface waters, and to ensure the long-term effectiveness of the Removal Action and the Remedial Action and their protectiveness of human health and the environment.

E. The restrictions in 3.A. through 3.D. above shall not apply if and only if, for the specific activity planned, Grantor first obtains from the Grantee (and by EPA pursuant to the Consent Decree) a written approval to a demonstration by Grantor, that the proposed disturbance: (a) constitutes a permissible use and it will not increase the potential hazard to public health, safety, or welfare or the environment; or (b) is necessary to reduce a threat to public health, safety or welfare or the environment. The VT DEC Commissioner and EPA's Director, Site Restoration and Remediation Division shall sign such written approval. This approval shall be recorded/or registered by Grantor in the Rockingham Land Records Office within twenty-one (21) days of receipt. A certified copy of the same shall be filed with VT DEC and EPA within twenty-one (21) days of the date of its recordation/and or registration.

Environmental Restrictions
Page 8 of 15

F. It is recognized and understood that, aside from the Capped Area, a portion of Parcel 7 is comprised of an active facility used as an office, a waste management dispatch area, a staging area for recycling and a vehicle maintenance area (identified as the "Active Facility Area" in Exhibit A). Subject to the limitations in 3.A. through 3.E. above, the Grantor shall have the right to continue to use Parcel 7 for the purposes listed above or for any other lawful use.

4. Applicability. The Environmental Restrictions established herein shall not apply to any and all activities or uses in, on, upon, through, over or under those portions of Parcel 7 and the Properties situated within the Site, or any portion thereof, duly authorized or approved by the Grantee pursuant to CERCLA and 10 V.S.A. §6615, and EPA pursuant to CERCLA and the Consent Decree, including, without limitation, all response actions authorized or approved by the State and/or EPA for the Site.

5. Emergency Excavation. In the event it becomes necessary to excavate a portion of the Properties, Parcel 7, or the Waterline Restriction Area, as part of a response to emergency repair of utility lines, or as part of a response to emergencies such as fire or flood, the activity and use restriction provisions of Paragraph 3 above, which would otherwise restrict such excavation, shall be suspended with respect to such excavation for the duration of such response, provided that Grantor:

A. orally notifies the VT DEC's Site Manager and EPA's Project Coordinator or, in his or her absence, EPA's Alternate Project Coordinator, or in the event of both of EPA's designated representatives are unavailable, the Director of the Waste Management Division, EPA Region I, of such emergency as soon as possible but no more than two (2) hours after having learned thereof, and follows up with a written notice to VT DEC and EPA; and

B. limits the actual disturbance involved in such excavation to the minimum reasonably necessary to adequately respond to the emergency.

This provision shall not waive liability for releases of hazardous substances, nor shall this provision excuse compliance with CERCLA or any other applicable federal or state laws and regulations.

6. Severability. If any court or other tribunal determines that any provision of this Grant is invalid or unenforceable, such provision shall be deemed to have been modified automatically to conform to the requirements for validity and enforceability as determined by such court or tribunal. In the event the provision invalidated is of such a nature that it cannot be so modified, the provision shall be deemed deleted from this Grant as though it had never been included herein. In either case, the remaining provisions of this Grant shall remain in full force and effect; provided, however, that the Grantee retains its right to modify this Grant pursuant to Paragraph 13 below.

Environmental Restrictions
Page 9 of 15

7. **Enforcement.** Grantor expressly acknowledges that a violation of the terms of this Grant could result in the following:

A. Upon a determination by a court of competent jurisdiction, in the issuance of criminal and civil penalties, and/or equitable remedies, including, but not limited to, injunctive relief, such injunctive relief could include, without limitation, the issuance of an order to modify or remove any improvements constructed upon those portions of the Properties or Parcel 7 situated within the Site in violation of the terms of the within Environmental Restrictions;

B. In the assessment of penalties and enforcement action by the Grantee or EPA, as its agent, to enforce the terms of the within Environmental Restrictions pursuant to CERCLA and the NCP, separate from, or in addition to, any penalties applicable by virtue of non-compliance with the Consent Decree; and

C. In the assessment by Grantee of all costs and expenses incurred by the State or EPA, as the Grantee's agent, in the event of either 7.A. or 7.B. above, including, without limitation, attorneys' fees.

Any action taken by the Grantee, or EPA as its agent, pursuant to this Section shall be in addition to, but not in lieu of, such rights as EPA and/or the State possess to enforce the terms and conditions of the Administrative Order and the Consent Decree, which enforcement rights the State and EPA fully reserve.

8. **Provisions to Run With the Land.** These Environmental Restrictions set forth rights, liabilities, agreements and obligations upon and subject to which the Properties and Parcel 7 or any portion thereof, shall be improved, held, used, occupied, leased, sold, hypothecated, encumbered, or conveyed. The rights, liabilities, agreements and obligations herein set forth shall run with the Properties and Parcel 7, as applicable thereto, and any portion thereof, and shall inure to the benefit of the Grantee and EPA, as its agent, and their successors and be binding upon Grantor and all parties claiming by, through or under Grantor. The rights hereby granted to the Grantee, and their successors and assigns, include the right of Grantee and EPA, as its agent, to enforce these Environmental Restrictions. Grantor hereby covenants for itself and its executors, administrators, heirs, successors and assigns, to stand seized and hold title to the Properties and Parcel 7, or any portion thereof, subject to these Environmental Restrictions, provided, however, that a violation of these Environmental Restrictions shall not result in a forfeiture or reversion of Grantor's title to the Properties and Parcel 7.

9. **Concurrence Presumed.** It being agreed that Grantor and all parties claiming by, through or under Grantor shall be deemed to be in accord with the provisions herein set forth and to agree for and among themselves and any party claiming by, through or under them, and their respective agents, contractors, sub-contractors and employees, that the Environmental Restrictions herein established

shall be adhered to and not violated and that their respective interests in the Properties and Parcel 7 shall be subject to the provisions herein set forth.

10. Incorporation into Deeds, Mortgages, Leases and Instruments of Transfer. Grantor hereby agrees to incorporate this Grant, in full or by reference, into all deeds, easements, mortgages, leases, licenses, occupancy agreements or any other instrument of transfer by which an interest in and/or a right to use the Properties and Parcel 7, or any portion thereof, is conveyed. Any transfer of the Properties and Parcel 7, or any portion thereof, shall take place only if the grantee agrees, as a part of the agreement to purchase or otherwise obtain an interest in the Properties or Parcel 7, that it will comply with the obligations of the Grantor to provide access and/or Institutional Controls, as set forth in Section X of the Consent Decree and this Grant, with respect to such Properties and/or Parcel 7.

11. Recordation. Grantor shall record and/or register this Grant with the Rockingham Land Records Office within ten (10) days of having received the Grantee's written approval of this Grant. The Grantor, within thirty (30) days of the date of recordation and/or registration, shall mail a certified Registry copy of this Grant to EPA Project Manager and VT DEC Site Manager.

Grantor shall record and/or register any amendment to or release of this Grant, made pursuant to Paragraph 13 below, with the Rockingham Land Records Office within thirty (30) days of having received from the Grantee said amendment or release, as agreed to and accepted by, or granted by, the Grantee and mailed to Grantor by certified mail, return receipt requested. Grantor shall file with VT DEC's and EPA's Site Managers a certified Registry copy of any such amendment or release as recorded and/or registered, within thirty (30) days of its date of recordation and/or registration.

This Grant shall become effective upon its recordation and/or registration with the Rockingham Land Records Office.

12. Legal Notice. This Grant shall be published as a legal notice, in a form prescribed by the Grantee, after a reasonable opportunity for review and comment by EPA, within fourteen (14) days of its date of execution, in a newspaper which circulates in the community in which the Properties and Parcel 7 are located.

Any amendment to or release of this Grant, made pursuant to Paragraph 13 below, shall be published as a legal notice, in a form prescribed by the Grantee, after a reasonable opportunity for review and comment by EPA, within fourteen (14) days of its date of execution, in a newspaper which circulates in the community in which the Properties and Parcel 7 are located.

13. Amendment Modification and Release. This Grant may be amended, modified, or released only by the Grantee, after a reasonable opportunity for review and comment by EPA, in accordance with CERCLA and the NCP, to the extent applicable. Grantor may submit to EPA and the VT DEC Site Manager a proposal for modifying or withdrawing the Environmental Restrictions or a portion

Environmental Restrictions
Page 11 of 15

thereof; however, Grantor shall not make a petition for amendment, modification or release prior to EPA's approval of the Groundwater Completion Report pursuant to Paragraph 57.b of the Consent Decree. Grantor shall have the right to petition for amendment, modification or release annually following EPA's approval of the Groundwater Completion Report pursuant to Paragraph 57.b of the Consent Decree. Said proposal shall demonstrate, that the Environmental Restrictions contained herein may be modified or withdrawn in whole or in part consistent with the public interest and the public purposes of protecting human health and the environment. The Grantee shall issue a written decision with an explanation of the reasons for the approval, modification, or denial of such petition.

Grantor shall pay any and all recording fees, land transfer taxes and other such transactional costs associated with any such amendment, modification, or release.

14. No Dedication Intended. Nothing herein set forth shall be construed to be a gift or dedication of the Properties or Parcel 7 to the Grantee, or to the general public for any purpose whatsoever.

15. Rights Reserved. It is expressly agreed that acceptance of this Grant by the Grantee shall not operate to bar, diminish, or in any way affect any legal or equitable right of the State and/or EPA to issue any future order or take response action with respect to the Site or in any way affect any other claim, action, suit, cause of action, or demand which the State and/or EPA may otherwise possess with respect thereto.

16. Filings with Grantee. All copies of instruments and documents to be filed with the VT DEC's and EPA's Site Managers, as required hereunder, shall be delivered to the VT DEC and EPA by any of the following methods: (i) hand delivery; (ii) delivery by overnight mail; or (iii) delivery by certified mail, return receipt requested.

17. Governing Law. It is expressly agreed that the law of the State of Vermont is the governing law covering this Grant and any disputes regarding its contents and interpretation.

18. Dispute Resolution. The dispute resolution procedures of this Paragraph shall be the exclusive mechanism to resolve disputes between the Grantor and the Grantee or EPA, as its agent, regarding petitions for amendment, modification or release under Paragraph 13 of this Grant.

A. Informal negotiations - Any dispute under this subparagraph shall in the first instance be the subject of informal negotiations between the parties to the dispute. The period for informal negotiations shall not exceed 30 days from the time the dispute arises, unless it is modified by written agreement of the parties. The dispute shall be considered to have arisen when one party sends the other parties a written Notice of Dispute. In the event that the parties cannot resolve a dispute by informal negotiations under this subparagraph, then the position advanced by the State, after a reasonable opportunity for review and comment by EPA, shall be considered binding unless, within 21 days after the conclusion of the informal negotiation period, Grantor invokes the formal

Environmental Restrictions
Page 12 of 15

dispute resolution procedures by serving on the State, with a copy to EPA, a written Statement of Position on the matter in dispute, including, but not limited to, any factual data, analysis or opinion supporting that position and any supporting documentation relied upon by the Grantor. Within twenty-one 21 days after receipt of Grantor's Statement of Position, the State, after a reasonable opportunity for review and comment by EPA, will serve on Grantor its Statement of Position, including, but not limited to, any factual data, analysis, or opinion supporting that position and supporting documentation relied upon by the State.

B. Formal Dispute Resolution - Formal dispute resolution shall provide for review on the administrative record under applicable principles of administrative law. An administrative record of the dispute shall be maintained by the State and shall contain all Statements of Position, including supporting documentation, submitted pursuant to this subparagraph. Where appropriate, the State may allow submission of supplemental Statements of Position by themselves or the Grantor. The VT DEC Sites Management Section will issue, after a reasonable opportunity for review and comment by EPA's Director of the Office of Site Remediation and Restoration, New England Region, a final administrative decision resolving the dispute based on the administrative record. This decision shall be binding upon the Grantor, subject only to the right to seek judicial review pursuant to subparagraph 18.C below.

C. Judicial Appeal - Any administrative decision made by the State pursuant to subparagraph 18.B shall be reviewable by a Court of competent jurisdiction, provided that a notice of judicial appeal is served by the Grantor on the State, with a copy to the United States, and within 10 days of receipt of the final administrative decision of the State. The notice of judicial appeal shall include a description of the matter in dispute, the efforts made by the parties to resolve it, and the relief requested. The State may file within 30 days a response to Grantor's notice of judicial appeal. In proceedings on any dispute governed by this subparagraph, Grantor shall have the burden of demonstrating that the decision of the VT DEC Director of Sites Management Section is arbitrary and capricious or otherwise not in accordance with law. Judicial review of the decision by the State shall be on the administrative record compiled pursuant to subparagraph 18.B above.

Environmental Restrictions
Page 13 of 15

IN WITNESS WHEREOF, DISPOSAL SPECIALISTS, INC. as record title-holder of the above described lands and premises, hereby submits this DECLARATION OF RESTRICTIONS, which said Declaration shall be recorded in the Land Records of the Town of Rockingham, Vermont.

Dated this 4th day of June, 1996.

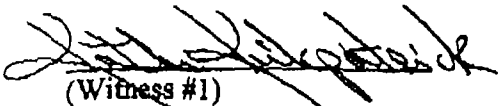

Disposal Specialists, Inc.

By:



Name: GERALD E. BURGER
Its Duly Authorized Agent

In the presence of:


(Witness #1)
(Witness #2)

Environmental Restrictions
Page 14 of 15

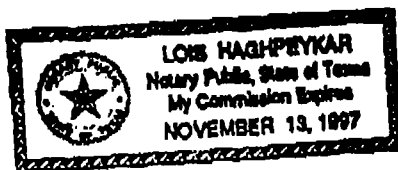
State of ~~Vermont~~ TEXAS
County of ~~Windham~~ ss.
HARRIS

On this 4th day of June, 1996, personally appeared GERARD K. BURGER,
signer(s) and sealer(s) of the foregoing written conveyance and acknowledged the same to be HIS
own free act and deed.

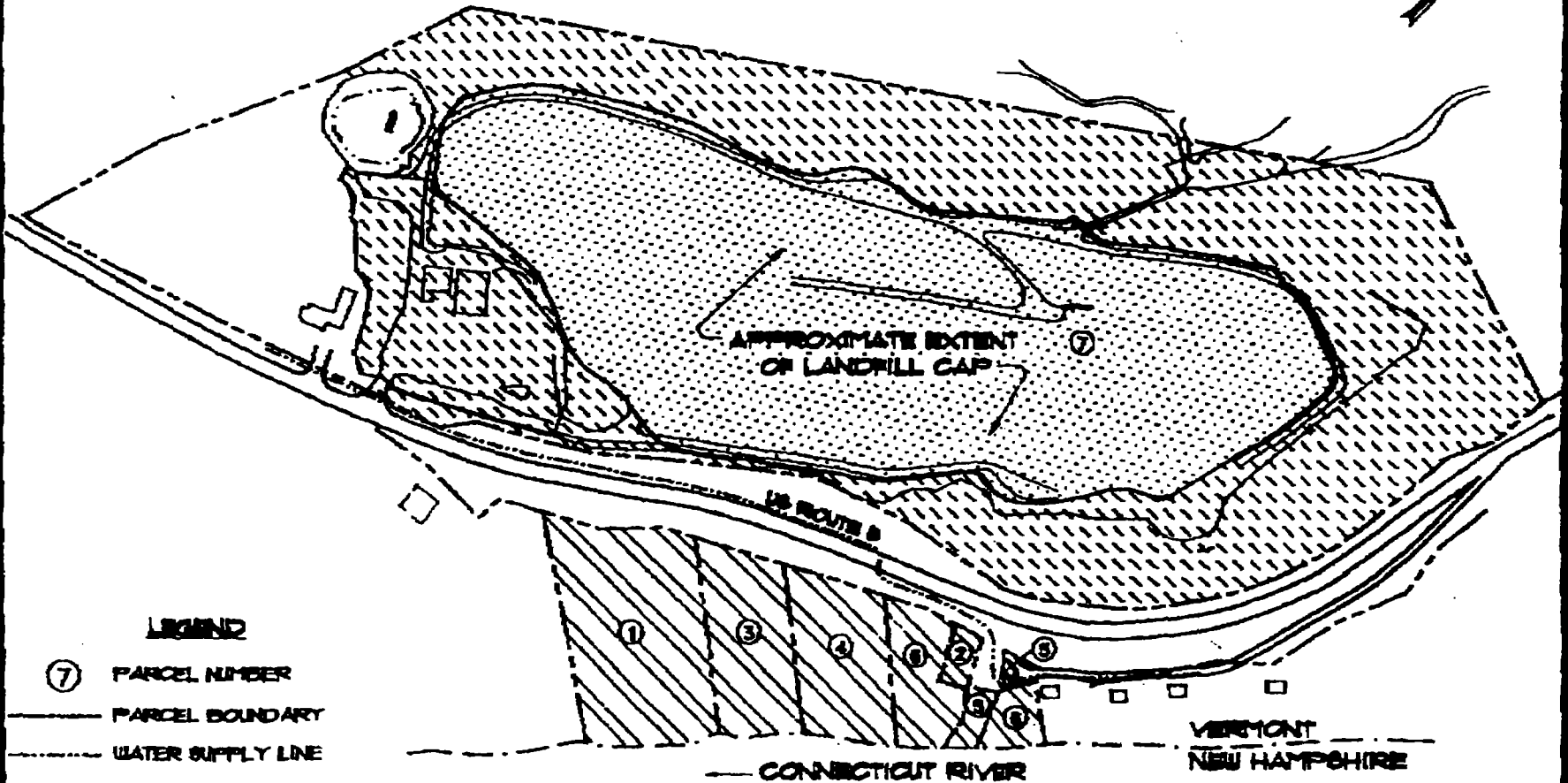
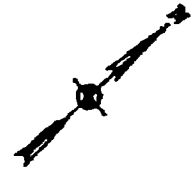
Before me, Lois Hagheykar
Notary Public

My Commission Expires: 11/13/97

ddrest.na



Post-It brand fax transmittal memo 7671		# of pages = 2
To: <i>George Lamb</i>	From: <i>Marion Guey</i>	
Co:	Co:	
Dept:	Phone #	
Fax # <i>(802) 463-1222</i>	Fax #	



LEGEND

- ⑦ PARCEL NUMBER
- PARCEL BOUNDARY
- - - WATER SUPPLY LINE
- ACTIVE FACILITY AREA
- CAPPED AREA
- GROUND WATER RESTRICTION AREA
- BUILDING

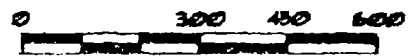
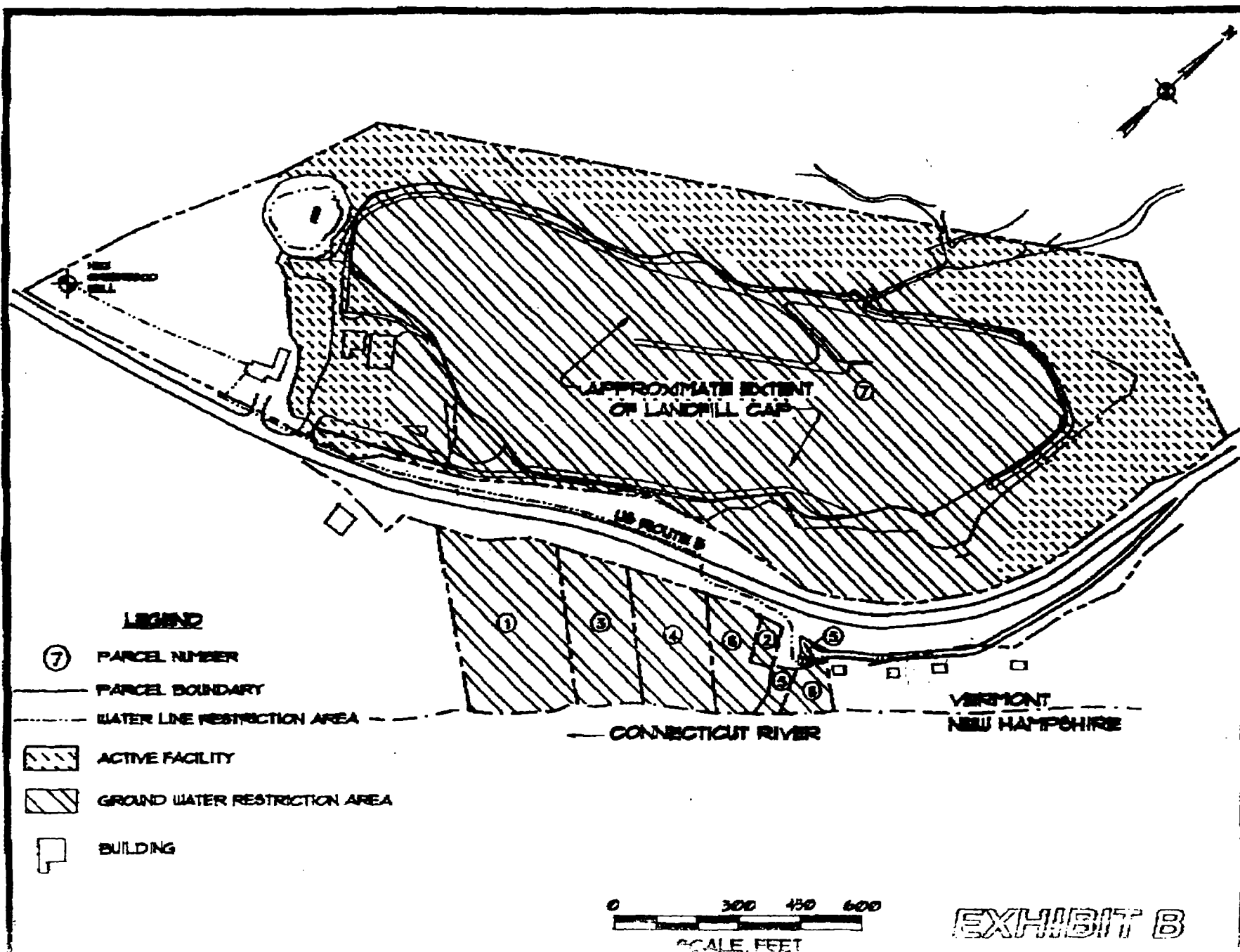


EXHIBIT A



APPENDIX C – MANN-KENDALL STATISTICAL TESTS (From URS, 2009, Appendix H)

APPENDIX C – MANN-KENDALL STATISTICAL TESTS (From URS, 2009, Appendix H)

Appendix H
Statistical Analysis of Groundwater Analytical Data
Exceeding Cleanup Criteria
Disposal Specialists, Inc. Landfill
Rockingham, Vermont

The non-parametric Mann-Kendall Test was combined with the coefficient of variation (CV) test to evaluate the significance of trends of constituents of interest that exceed cleanup criteria in groundwater at the Disposal Specialists, Inc. Landfill located in Rockingham, Vermont. The Mann-Kendall Test is considered to be appropriate for evaluating trends in the data for the following reasons:

- This test is designed to handle data that are non-parametric (i.e., do not exhibit a specific distribution such as normal or log normal);
- The data set can contain data collected at irregularly spaced intervals in time; and
- The data set can contain elevated (outlier) values compared to the average or non-detect results.

The Mann-Kendall Test requires data from at least four sampling events. As with many statistical tests, the validity of the results is increased with a large data set.

Statistical testing was not performed for monitoring wells exhibiting only one or two positive results for a particular constituent of interest or variable detection limits since such data sets could result in the false identification of either an increasing or decreasing trend even though each of the data points could be essentially identical. Statistical tests were also not performed for data sets in which results from the most recent sampling event was less than the associated cleanup criterion for the analyte of interest.

The Mann-Kendall Test was performed using the following procedure:

- Since the Mann-Kendall Test is not valid for unadjusted data that exhibits seasonal behavior, the data for each monitoring well was evaluated for seasonal behavior by plotting concentrations of constituents of interest and groundwater elevations measured during each sampling event with time. Wells where concentrations of constituents of interest and groundwater elevations exhibited parallel or inverse trends were judged to be

seasonally affected. In such cases, only seasons with the highest concentrations were used.

- Once the final data set to be assessed was identified, concentrations for constituents of interest were ranked in the order in which they were collected.
- Each result for the constituent of interest was compared sequentially to results for that constituent that followed in time (i.e., result for sampling event 1 was compared to results for sampling events 2 through n (n = number of sampling events), then the result for sampling event 2 was compared to the results for sampling events 3 through n until a comparison of all the data was completed in this manner).
- The Mann-Kendall Statistic (S) was calculated by comparing the number of times the concentration for the constituent of interest increased (was positive) to the number of times the constituent concentration decreased (was negative) between sampling events. The difference between the number of positive results and number of negative results yields S . The calculated result for S and the number of data points evaluated (n) were used along with a standard statistical probability table for the Mann-Kendall Test to determine if a trend was present at a minimum 80 percent confidence interval.

For wells having a sample population less than or equal to 10 (i.e., $n \leq 10$), a decreasing trend was identified when S was a large negative number less than the maximum S statistic (S_{max}) and the probability value determined from S and n was less than the significance level (i.e., 0.1 for 90 percent confidence interval and 0.2 for an 80 percent confidence interval). An increasing trend was identified when S was positive, greater than the absolute value of S_{max} for a specific n , and the probability determined from S and n was less than the significance level. For those wells having a sample population greater than 10 (i.e., $n > 10$), the dataset was truncated to the ten most recent data points.

- In instances where the Mann-Kendall Test indicated that no trend was present, a CV Test was performed to assess whether the concentration at the well is stable. The CV Test was performed by dividing the standard deviation of the concentration of the constituent of interest at a particular well by the arithmetic mean concentration. A CV less than or equal to 1 indicates little scatter in the data set and a stable concentration. Conversely, a CV greater than 1 indicates a large degree of scatter and unstable concentrations.

Statistical summaries of analytical data exceeding cleanup criteria at specific monitoring wells are attached.

**APPENDIX H
MANN-KENDALL STATISTICAL TEST**

**DISPOSAL SPECIALISTS, INC. LANDFILL
ROCKINGHAM, VERMONT**

Site Name = Disposal Specialists, Inc. Landfill, Rockingham, Vermont						Well Number = MW-4	
Event Number	Compound -> Sampling Date (most recent last)	Manganese Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	19-Sep-00	7,190.00					
2	25-Sep-01	6,960.00					
3	26-Sep-02	5,930.00					
4	23-Sep-03	5,520.00					
5	22-Sep-04	7,220.00					
6	20-Sep-05	6,710.00					
7	19-Sep-06	6,430.00					
8	18-Sep-07	6,430.00					
9	23-Sep-08	6,150.00					
10							
Mann Kendall Statistic (S) =		-11.0	0.0	0.0	0.0	0.0	0.0
Number of Rounds (n) =		9	0	0	0	0	0
Average =		6504.44	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Standard Deviation =		577.454	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Coefficient of Variation(CV)=		0.089	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		DECREASING	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		No Trend	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at 80% Confidence Level		NA	n<4	n<4	n<4	n<4	n<4
Data Entry By = MR			Date = 17-Dec-08		Checked By = MR		

APPENDIX H
MANN-KENDALL STATISTICAL TEST
DISPOSAL SPECIALISTS, INC. LANDFILL
ROCKINGHAM, VERMONT

Site Name = Disposal Specialists, Inc. Landfill, Rockingham, Vermont						Well Number = MW-6	
Compound ->	Arsenic	Manganese	Benzene				
Event	Concentration	Concentration	Concentration	Concentration	Concentration	Concentration	Concentration
Number	(leave blank if no data)	(leave blank if no data)	(leave blank if no data)	(leave blank if no data)	(leave blank if no data)	(leave blank if no data)	(leave blank if no data)
1	25-Sep-01	263.00	1,700.00	9.40			
2	26-Sep-02	242.00	1,820.00	7.20			
3	21-Sep-03	242.00	1,700.00	9.40			
4	22-Sep-04	274.00	2,050.00	8.40			
5	20-Sep-05	263.00	1,870.00	7.40			
6	19-Sep-06	252.00	1,790.00	6.30			
7	18-Sep-07	265.00	1,760.00	7.20			
8	23-Sep-08	241.00	1,930.00	6.00			
9							
10							
Mann Kendall Statistic (S) =		-2.0	7.0	-18.0	0.0	0.0	0.0
Number of Rounds (n) =		8	8	8	0	0	0
Average =		255.25	1827.50	7.66	#DIV/0!	#DIV/0!	#DIV/0!
Standard Deviation =		12.714	119.732	1.293	#DIV/0!	#DIV/0!	#DIV/0!
Coefficient of Variation(CV)=		0.050	0.066	0.169	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected					n<4	n<4	n<4
Trend ≥ 80% Confidence Level		No Trend	No Trend	DECREASING	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		No Trend	No Trend	DECREASING	n<4	n<4	n<4
Stability Test, If No Trend Exists at 80% Confidence Level		CV ≤ 1 STABLE	CV ≤ 1 STABLE	NA	n<4 n<4	n<4 n<4	n<4 n<4
Data Entry By = MR			Date = 17-Dec-08		Checked By = MR		

**APPENDIX H
MANN-KENDALL STATISTICAL TEST**

**DISPOSAL SPECIALISTS, INC. LANDFILL
ROCKINGHAM, VERMONT**

Site Name = Disposal Specialists, Inc. Landfill, Rockingham, Vermont						Well Number = MW-7	
Compound ->		Manganese					
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	25-Sep-01	1,220.00					
2	26-Sep-02	1,390.00					
3	23-Sep-03	1,360.00					
4	22-Sep-04	1,600.00					
5	20-Sep-05	1,560.00					
6	19-Sep-06	1,690.00					
7	18-Sep-07	1,650.00					
8	23-Sep-08	1,540.00					
9							
10							
Mann Kendall Statistic (S) =		14.0	0.0	0.0	0.0	0.0	0.0
Number of Rounds (n) =		8	0	0	0	0	0
Average =		1501.25	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Standard Deviation =		162.079	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Coefficient of Variation(CV)=		0.108	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		INCREASING	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		INCREASING	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at 80% Confidence Level		NA	n<4	n<4	n<4	n<4	n<4
Data Entry By = MR			Date = 17-Dec-08		Checked By = MR		

**APPENDIX H
MANN-KENDALL STATISTICAL TEST**

**DISPOSAL SPECIALISTS, INC. LANDFILL
ROCKINGHAM, VERMONT**

Site Name = Disposal Specialists, Inc. Landfill, Rockingham, Vermont						Well Number = MW-9	
Compound ->		PCE					
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	19-Sep-00	12.00					
2	25-Sep-01	7.50					
3	24-Sep-02	7.40					
4	23-Sep-03	8.50					
5	21-Sep-04	6.10					
6	20-Sep-05	4.80					
7	19-Sep-06	6.50					
8	18-Sep-07	5.60					
9	23-Sep-08	4.70					
10							
Mann Kendall Statistic (S) =		-26.0	0.0	0.0	0.0	0.0	0.0
Number of Rounds (n) =		9	0	0	0	0	0
Average =		7.01	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Standard Deviation =		2.259	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Coefficient of Variation(CV)=		0.322	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		DECREASING	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		DECREASING	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at 80% Confidence Level		NA	n<4	n<4	n<4	n<4	n<4
Data Entry By = MR			Date = 17-Dec-08		Checked By = MR		

**APPENDIX H
MANN-KENDALL STATISTICAL TEST**

**DISPOSAL SPECIALISTS, INC. LANDFILL
ROCKINGHAM, VERMONT**

Site Name = Disposal Specialists, Inc. Landfill, Rockingham, Vermont						Well Number = MW-9	
Event Number	Compound -> Sampling Date (most recent last)	Chromium Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	25-Sep-01	240.00					
2	26-Sep-02	121.00					
3	23-Sep-03	83.20					
4	21-Sep-04	265.00					
5	20-Sep-05	160.00					
6	19-Sep-06	63.60					
7	18-Sep-07	63.50					
8	23-Sep-08	98.00					
9							
10							
Mann Kendall Statistic (S) =		-12.0	0.0	0.0	0.0	0.0	0.0
Number of Rounds (n) =		8	0	0	0	0	0
Average =		136.79	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Standard Deviation =		78.361	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Coefficient of Variation(CV)=		0.573	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		DECREASING	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		DECREASING	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at 80% Confidence Level		NA	n<4	n<4	n<4	n<4	n<4
Data Entry By = MR			Date = 17-Dec-08		Checked By = MR		

**APPENDIX H
MANN-KENDALL STATISTICAL TEST**

**DISPOSAL SPECIALISTS, INC. LANDFILL
ROCKINGHAM, VERMONT**

Site Name = Disposal Specialists, Inc. Landfill, Rockingham, Vermont

Well Number = MW-10

Compound ->		PCE					
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	19-Sep-00	5.30					
2	25-Sep-01	3.80					
3	24-Sep-02	2.60					
4	23-Sep-03	1.80					
5	21-Sep-04	2.10					
6	20-Sep-05	1.50					
7	19-Sep-06	1.90					
8	18-Sep-07	2.20					
9	23-Sep-08	1.60					
10							
Mann Kendall Statistic (S) =		-20.0	0.0	0.0	0.0	0.0	0.0
Number of Rounds (n) =		9	0	0	0	0	0
Average =		2.53	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Standard Deviation =		1.247	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Coefficient of Variation(CV)=		0.492	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		DECREASING	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		DECREASING	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at 80% Confidence Level		NA	n<4	n<4	n<4	n<4	n<4
Data Entry By = MR			Date = 17-Dec-08		Checked By = MR		

**APPENDIX H
MANN-KENDALL STATISTICAL TEST**

**DISPOSAL SPECIALISTS, INC. LANDFILL
ROCKINGHAM, VERMONT**

Site Name = Disposal Specialists, Inc. Landfill, Rockingham, Vermont						Well Number = MW-B13D	
Event Number	Compound -> Sampling Date (most recent last)	2-Butanone Concentration (leave blank if no data)	Methylene Chloride Concentration (leave blank if no data)	Vinyl Chloride Concentration (leave blank if no data)	Arsenic Concentration (leave blank if no data)	Barium Concentration (leave blank if no data)	Manganese Concentration (leave blank if no data)
1	12-May-04	4,500.00	79.00	22.00	120.00	46,700.00	4,790.00
2	22-Sep-04	3,000.00	52.00	25.00	126.00	33,800.00	4,720.00
3	25-May-05	1,500.00	20.00	4.00	98.10	36,100.00	1,550.00
4	21-Sep-05	920.00	5.00	2.00	197.00	48,600.00	1,690.00
5	17-May-06	73.00	2.40	1.60	68.70	15,400.00	260.00
6	19-Sep-06	6.20	10.00	2.10	87.50	14,400.00	223.00
7	23-May-07	25.00	5.00	5.00	64.20	12,500.00	204.00
8	19-Sep-07	1,300.00	30.00	5.00	118.00	27,800.00	445.00
9	21-May-08	12.00	2.50	5.00	39.60	11,500.00	272.00
10							
Mann Kendall Statistic (S) =		-24.0	-17.0	-3.0	-18.0	-22.0	-22.0
Number of Rounds (n) =		9	9	9	9	9	9
Average =		1259.58	22.88	7.97	102.12	27422.22	1572.67
Standard Deviation =		1571.771	26.684	8.943	45.877	14690.795	1892.503
Coefficient of Variation(CV)=		1.248	1.166	1.123	0.449	0.536	1.203
Error Check, Blank if No Errors Detected							
Trend ≥ 80% Confidence Level		DECREASING	DECREASING	No Trend	DECREASING	DECREASING	DECREASING
Trend ≥ 90% Confidence Level		DECREASING	DECREASING	No Trend	DECREASING	DECREASING	DECREASING
Stability Test, If No Trend Exists at 80% Confidence Level		NA	NA	CV > 1 NON-STABLE	NA	NA	NA
Data Entry By = HSP		Date = 22-Jan-08			Checked By = MR		

**APPENDIX H
MANN-KENDALL STATISTICAL TEST**

**DISPOSAL SPECIALISTS, INC. LANDFILL
ROCKINGHAM, VERMONT**

Site Name = Disposal Specialists, Inc. Landfill, Rockingham, Vermont						Well Number = MW-B13D	
Event Number	Compound -> Sampling Date (most recent last)	Nickel Concentration (leave blank if no data)	Benzene Concentration (leave blank if no data)	Total Xylene Concentration (leave blank if no data)	PCE Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	12-May-04	112.00	28.00	250.00	24.00		
2	22-Sep-04	138.00	17.00	79.00	15.00		
3	25-May-05	90.00	11.00	240.00	7.50		
4	21-Sep-05	215.00	4.60	40.00	3.00		
5	17-May-06	54.80	13.00	730.00	3.00		
6	20-Sep-06	53.10	1.30	640.00	1.90		
7	23-May-07	45.20	12.00	1,200.00	5.00		
8	19-Sep-07	64.40	32.00	200.00	5.00		
9	21-May-08	51.90	8.10	550.00	5.00		
10							
Mann Kendall Statistic (S) =		-20.0	-8.0	8.0	-14.0	0.0	0.0
Number of Rounds (n) =		9	9	9	9	0	0
Average =		91.60	14.11	436.56	7.71	#DIV/0!	#DIV/0!
Standard Deviation =		56.019	10.169	377.113	7.235	#DIV/0!	#DIV/0!
Coefficient of Variation(CV)=		0.612	0.721	0.864	0.938	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected						n<4	n<4
Trend ≥ 80% Confidence Level		DECREASING	No Trend	No Trend	DECREASING	n<4	n<4
Trend ≥ 90% Confidence Level		DECREASING	No Trend	No Trend	DECREASING	n<4	n<4
Stability Test, If No Trend Exists at 80% Confidence Level		NA	CV ≤ 1 STABLE	CV ≤ 1 STABLE	NA	n<4 n<4	n<4 n<4
Data Entry By = HSP		Date = 22-Jan-08		Checked By = MR			

**APPENDIX H
MANN-KENDALL STATISTICAL TEST**

**DISPOSAL SPECIALISTS, INC. LANDFILL
ROCKINGHAM, VERMONT**

Site Name = Disposal Specialists, Inc. Landfill, Rockingham, Vermont

Well Number = MW-D19

Compound ->		Manganese					
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	20-Sep-04	7,630.00					
2	21-Sep-05	2,520.00					
3	19-Sep-06	1,210.00					
4	19-Sep-07	3,910.00					
5	24-Sep-08	381.00					
6							
7							
8							
9							
10							
Mann Kendall Statistic (S) =		-6.0	0.0	0.0	0.0	0.0	0.0
Number of Rounds (n) =		5	0	0	0	0	0
Average =		3130.20	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Standard Deviation =		2849.294	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Coefficient of Variation(CV)=		0.910	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		DECREASING	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		No Trend	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at 80% Confidence Level		NA	n<4	n<4	n<4	n<4	n<4
Data Entry By = MR			Date = 17-Dec-08		Checked By = MR		

**APPENDIX H
MANN-KENDALL STATISTICAL TEST**

**DISPOSAL SPECIALISTS, INC. LANDFILL
ROCKINGHAM, VERMONT**

Site Name = Disposal Specialists, Inc. Landfill, Rockingham, Vermont					Well Number = MW-E22		
	Compound ->	Methylene Chloride					
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	20-Sep-04	3.00					
2	21-Sep-05	11.00					
3	20-Sep-06	14.00					
4	19-Sep-07	13.00					
5	24-Sep-08	250.00					
6							
7							
8							
9							
10							
	Mann Kendall Statistic (S) =	8.0	0.0	0.0	0.0	0.0	0.0
	Number of Rounds (n) =	5	0	0	0	0	0
	Average =	58.20	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Standard Deviation =	107.307	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Coefficient of Variation(CV)=	1.844	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		INCREASING	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		INCREASING	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at 80% Confidence Level		NA	n<4	n<4	n<4	n<4	n<4
Data Entry By = MR			Date = 17-Dec-08		Checked By = MR		

**APPENDIX H
MANN-KENDALL STATISTICAL TEST**

**DISPOSAL SPECIALISTS, INC. LANDFILL
ROCKINGHAM, VERMONT**

Site Name = Disposal Specialists, Inc. Landfill, Rockingham, Vermont					Well Number = MW-G25		
Compound ->		Manganese	Arsenic				
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	29-Sep-99	2,810.00	48.90				
2	19-Sep-00	4,700.00	40.10				
3	25-Sep-01	4,630.00	59.20				
4	26-Sep-02	7,100.00	88.10				
5	23-Sep-03	3,800.00	46.80				
6	20-Sep-04	51.00	5.30				
7	21-Sep-05	6,160.00	23.00				
8	19-Sep-06	5,550.00	18.00				
9	19-Sep-07	4,950.00	113.00				
10	24-Sep-08	5,740.00	8.00				
Mann Kendall Statistic (S) =		11.0	-11.0	0.0	0.0	0.0	0.0
Number of Rounds (n) =		10	10	0	0	0	0
Average =		4549.10	45.04	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Standard Deviation =		1986.921	34.775	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Coefficient of Variation(CV)=		0.437	0.772	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected				n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		INCREASING	DECREASING	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		No Trend	No Trend	n<4	n<4	n<4	n<4
Stability Test, if No Trend Exists at 80% Confidence Level		NA	NA	n<4	n<4	n<4	n<4
Data Entry By = MR		Date = 27-Dec-08		Checked By = MR			

**APPENDIX H
MANN-KENDALL STATISTICAL TEST**

**DISPOSAL SPECIALISTS, INC. LANDFILL
ROCKINGHAM, VERMONT**

Site Name = Disposal Specialists, Inc. Landfill, Rockingham, Vermont

Well Number = MW-J37

Compound ->		Manganese					
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	25-Sep-01	3,450.00					
2	26-Sep-02	3,270.00					
3	23-Sep-03	2,460.00					
4	20-Sep-04	4,480.00					
5	20-Sep-05	3,340.00					
6	18-Sep-07	2,910.00					
7	23-Sep-08	3,040.00					
8							
9							
10							
Mann Kendall Statistic (S) =		-5.0	0.0	0.0	0.0	0.0	0.0
Number of Rounds (n) =		7	0	0	0	0	0
Average =		3278.57	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Standard Deviation =		624.431	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Coefficient of Variation(CV)=		0.190	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		No Trend	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		No Trend	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at 80% Confidence Level		CV ≤ 1 STABLE	n<4 n<4	n<4 n<4	n<4 n<4	n<4 n<4	n<4 n<4
Data Entry By = MR			Date = 17-Dec-08		Checked By = MR		

APPENDIX D – JUNE 2009 NOBIS SITE INSPECTION REPORT



Nobis Engineering, Inc.
18 Chenell Drive
Concord, NH 03301
Tel (603) 224-4182
Fax (603) 224-2507
www.nobisengineering.com

EPA Region 1 RAC2 Contract No. EP-S1-06-03

June 23, 2009
Nobis Project No. 80015
NH-2094-2009-D

Via Electronic Submittal

U.S. Environmental Protection Agency, Region 1
Attention: Mr. Edward Hathaway, Task Order Project Officer
1 Congress Street, Suite 1100
Boston, Massachusetts 02114-2023

Subject: Transmittal of the Fall 2008 and Spring 2009 Inspection Report
BFI-Rockingham Landfill Superfund Site, Rockingham, Vermont
Long-Term Removal Action Oversight
Task Order Number 0015-RX-ME-01B6

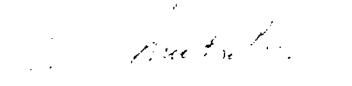
Dear Mr. Hathaway:

Attached with this correspondence are the Nobis Engineering comments for the landfill inspections conducted on November 6, 2008 and May 4, 2009 at the BFI-Rockingham Landfill Superfund Site.

Should you have any questions or comments, please contact me at (603) 724-6236 or by email at cadams@nobisengineering.com.

Sincerely,

NOBIS ENGINEERING, INC.


J. Christopher Adams, P.E.
Project Manager

Attachments:

c: File 80015/MA (w/enc.)

**SEMI-ANNUAL INSPECTION REPORT
BFI-ROCKINGHAM LANDFILL SUPERFUND SITE
ROCKINGHAM, VERMONT**

1.0 INTRODUCTION

This report combines the observations made by Nobis Engineering, Inc. (Nobis) during the Fall 2008 inspection and Spring 2009 inspection of the BFI-Rockingham Landfill Superfund Site (Site) conducted on November 6, 2008, and May 4, 2009, respectively. The Site inspections were conducted by Nobis. A representative from URS, an engineering firm retained by the potentially responsible party (PRP) to provide landfill engineering services, was present for the Fall 2008 inspection, and accompanied the Nobis inspector during the inspection. Representatives from EPA and the PRP visited the Site during the Spring 2009 inspection, but did not accompany the Nobis inspector during the inspection.

The Nobis inspections included the following activities:

- The Nobis inspector walked the perimeter and top of the landfill cap to look for evidence of erosion, cap disturbance, settlement, and poor growth of vegetation.
- On and off-cap storm water control structures were inspected for damage, settlement, sedimentation, vegetation and blockage.
- The above ground portions of structures that penetrate the cap (i.e., gas vents, etc.) were inspected for damage.

A site-specific inspection checklist was used to document the inspections; separate checklists are provided for the Fall 2008 and Spring 2009 inspections (both included in Attachment 1). This report is based on visual inspections with reference to the as-built drawings of the cover system installation. The evaluation of subsurface conditions was not within the scope of this inspection. Observations made during the inspections are summarized below.

2.0 SUMMARY OF INSPECTION

The results of the inspections are presented according to the various components of the landfill cover system. Where appropriate, conditions identified in the Fall 2008 inspection are compared to those observed during the Spring 2009 inspection. The following sections of the report correspond to the inspection items listed in the checklist. See Figures 1 and 2 for site features presentation and current conditions observed (included as part of Attachment 1). Both figures show observations from the Fall 2008 inspection and the Spring 2009 inspection; Figure 1 shows the southern half of the landfill and Figure 2 shows the northern half of the landfill. Photos documenting observations noted during both inspections are provided in Attachments 2 and 3.

Landfill Surface

The landfill surface is generally in good condition, with a few specific areas to monitor for possible future maintenance needs:

- During the Spring 2008 inspection, the inspectors observed the following just uphill of the northeastern detention basin (see Figure 2, Item 1):
 - Stressed vegetation with some loss of growth and geomembrane showing. There is no gully formation and no odor of gas. There are 12" diameter hummocks present. The inspectors recommend topsoil replacement and seeding, with continued watching of the area.
 - Slope creep with surficial cracks and separation of vegetation.
 - Some damage to grass that appears to be caused by mowing or by animals.
 - As of the Fall 2008 inspection, this area appears to have been provided with fill and seed to repair grass damage. Grass cover still shows improvement as of the Spring 2009 inspection. This area should continue to be watched for changes to the above-noted items and necessary maintenance to grass cover.

- Photo 1 from the Fall 2008 inspection and Photo 1 from the Spring 2009 inspection both show this area.
- During the Spring 2008 inspection, the inspectors observed a small slump northwest of the downchute just uphill of the northern detention basin (see Figure 2, Item 2). No changes were observed during the Fall 2008 or Spring 2009 inspections. Photo 2 from the Fall 2008 inspection and Photo 2 from the Spring 2009 inspection both show this area.
- Three areas of thin grass and possible mower damage were observed (see Figure 2, Items 3 to 5):
 - Just off the southern edge of the access road on the top level of the landfill, opposite EW-36, is an area of thin grass and mower damage (see Figure 2, Item 3, and Photo 3 from the Spring 2009 inspection).
 - Near EW-36 is a depression that appears to slope downstream to a bench. This should be provided with fill and seed, and monitored for additional erosion damage (see Photo 4 from the Spring 2009 inspection and Figure 2, Item 4).
 - Immediately below EW-22 is damage to grass most likely caused by mower damage (see Photo 5 from the Spring 2009 inspection and Figure 2, Item 5).

Benches

The inspectors observed the following items listed below in the landfill's benches (see Figures 1 and 2, specific items as referenced):

- Vegetation in a bench near the northeastern downchute (Figure 2, Item 6). Photo 3 from the Fall 2008 inspection and Photo 6 from the Spring 2009 inspection both show this area.
- Vegetation in a bench near EW-37 (see Photo 7 from the Spring 2009 inspection and Figure 2, Item 2).

- Vegetation in a bench downslope from EW-36 (see Figure 2, Item 7).
- Dead vegetation in a bench downslope of EW-32 (see Figure 1, Item 8).
- A depression in a bench near EW-15 (see Photo 8 from the Spring 2009 inspection and Figure 1, Item 9). This was present in the Spring of 2008 and Fall of 2008, and had not changed for the Spring 2009 inspection.
- Small plants in a ditch near the northeastern downchute (see Figure 2, Item 10)

Letdown Channels (Downchutes)

The gabion-lined downchutes on the southeast, north, and south sides of the landfill appeared to be in good condition for both the Fall 2008 and Spring 2009 inspections.

Cover Penetrations

Cover penetrations consist of 39 active gas vent structures (see Photo 9 from the Spring 2009 inspection for Extraction Well (EW)-36). Most of the gas vents are leaning down slope at various degrees of tilt, most likely caused by landfill cap settlement. Because the landfill's gas flare is operating normally and there is no odor of gas detected, the inspector believes that the landfill's gas containment system is functioning properly.

Monitoring Wells

No damage was observed to the monitoring wells located adjacent to the landfill. The wells appear to be in good condition during both the Fall 2008 and Spring 2009 inspections.

Cover Drainage Layer

The landfill's drainage outlet pipes appear to be in good condition and operating normally for both the Fall 2008 and Spring 2009 inspections.

Detention Basin

The detention basins were in good condition. Vegetation is present in the northeastern detention basin (see Photo 4 from the Fall 2008 inspection, Photo 10 from the Spring 2009 inspection, and Figure 2, Item 11). Small trees in the northern detention basin that were observed during the Spring 2008 inspection are still present (see Photo 5 from the Fall 2008 inspection and Photo 11 from the Spring 2009 inspection, and Figure 2, Item 12). During the Fall 2008 inspection, minor amounts of vegetation were observed in the southern detention basin near the Site's parking lot (Photo 6 from the Fall 2008 inspection). As of the Spring 2009 inspection, this vegetation has been removed (Photo 12 from the Spring 2009 inspection).

Retaining Walls

The gabion baskets forming the retaining structure along three areas of the landfill were inspected: the eastern side of the landfill; the south wall of the northern detention basin; and the west wall of the northeast detention basin. Previous inspections observed tilting at the west wall of the northeast detention basin. This tilting is still present but appears stable. Two spots of settling are present along the top of the wall. These were first observed in the Spring of 2008 and have not changed during the Fall 2008 or Spring 2009 inspections. The inspector recommends monitoring this area for possible future repairs (see Photos 13 and 14 from the Spring 2009 inspection, and Figure 2, Item 11).

Perimeter Ditches and Off-Site Discharge

The perimeter ditches and off-site discharge structures appear to be in good condition for both the Fall 2008 and Spring 2009 inspections. The inspector walked the upper portion of the length of the 18" diameter HDPE overflow pipe from the north basin, and found it to be in good condition (see Photo 15 from the Spring 2009 inspection).

Perimeter Roads

The perimeter roads were in good condition with no signs of erosion, ruts, or potholes for both the Fall 2008 and Spring 2009 inspections. Some sections of the landfill perimeter have fencing; no damage was observed in either the Fall 2008 or Spring 2009 inspections.

Landfill Gas Flare

The landfill gas flare was operating at the time of both the Fall 2008 and Spring 2009 inspections. Routine maintenance of the gas extraction wells is conducted by Gas Recovery Systems (GRS) of Chicopee, MA. The gas flare is shown in Photo 7 in the Fall 2008 inspection report.

Route 5 Interceptor Trench

This trench was inspected and found to be in good condition (see Photo 16 from the Spring 2009 inspection).

Seep 6 Area

This area was inspected and found to be in good condition (see Photo 17 from the Spring 2009 inspection).

3.0 CORRECTIVE ACTIONS

This section describes the status of previously recommended corrective actions.

Status of Corrective Actions

- Areas of erosion and mower damage have been filled and seeded, and monitoring of grass condition is ongoing.
- Small trees in the northeastern detention basin (Figure 2, Item 11) and vegetation in the northern detention basin remain (Figure 2, Item 12).
- Some vegetation in benches observed in the Spring of 2008 has been removed; however, additional vegetation is now present in the Spring of 2009 (Figure 1, Item 8, and Figure 2, Items 6, 7, and 10). Routine maintenance should be performed to remove vegetation yearly.

- Many of the recommendations in prior reports involve monitoring of items such as gas vent tilt, settling in slope benches, and erosion repair. This monitoring process is continuing.

4.0 RECOMMENDATIONS

The following recommendations are based on the observations made during the November 2008 and May 2009 inspections:

- The following areas should be filled and seeded:
 - Just off the southern edge of the access road on the top level of the landfill, opposite EW-36, is an area of thin grass and mower damage (Figure 2, Item 3).
 - Near EW-36 is a depression that appears to slope downstream to a bench (Figure 2, Item 4). This should be provided with fill and seed, and monitored for future erosion damage.
 - Immediately below EW-22 is a damaged grass area most likely caused by mower damage (Figure 2, Item 5).
- Low points in the slope bench drainage channels should be monitored for additional settlement and/or associated cap erosion. The same should be done for the slump to the northwest of the northern downchute (Figure 2, Item 2). If settlement continues, the affected area should be surveyed for changes in flow patterns.
- Vegetation should be removed from the following bench locations:
 - Vegetation in a bench near EW-37 (Figure 2, Item 2).
 - Vegetation in a bench near the southeastern downchute (Figure 2, Item 6).
 - Vegetation in a bench downslope from EW-36 (Figure 2, Item 7).

- Dead vegetation in a bench downslope of EW-32 (Figure 1, Item 8).
- Continue to monitor tilting gas vents for increased landfill cap settling, and evaluate changes in flow patterns if settling continues.
- Remove vegetation in the northeastern detention basin (Figure 2, Item 11) and small trees in the northern detention basin (Figure 2, Item 12).
- Continue to monitor gabion retaining wall tilting and settling in the northeastern detention basin (Figure 2, Item 11). If tilting or settling increases, repair as needed.

Attachment 1

**Inspection Checklist and Site Plan
November 6, 2008
May 4, 2009**



EPA RAC Contract # EP-S1-06-03

SEMI-ANNUAL LANDFILL INSPECTION CHECKLIST

Task Order: 0015-RX-ME-01B6 Weather: Sunny
 Site Name: BFI-Rockingham Landfill Temperature: 45°F
 Town: Rockingham Site Map: Attach Map
 State: Vermont Date of Inspection: 11/6/08
 PRP Representatives: Roger Bellarox (WRP)
 Inspection Team: R. W. Walker (Nobis)

ITEM	REMARKS
LANDFILL SURFACE	
1. SETTLEMENT (LOW SPOTS) Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	Small slump at downstate NW of northern detention basin - unchanged since 5/2008
2. CRACKS Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Location (indicate on site map): Length: Width: Depth:	Slope creep (downstate) cracks noted in 5/2008 unchanged (uphill from northern detention basin)
3. EROSION Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	area noted in 5/2008 uphill of NE detention basin has been provided with fill, stable
4. HOLES Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Depth: Suspected Cause (rodent or other):	
5. VEGETATIVE COVER Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Grass: Condition: Trees/Shrubs: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Size:	- stressed veg. uphill of NE detention basin observed in 5/2008, provided w/ fill used, continue to watch
6. ARMORED COVER Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Material Type: Condition:	
7. BULGES Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Height: Suspected Cause (gas pressure or other):	

2



EPA RAC Contract # EP-S1-06-03

ITEM	REMARKS
LETDOWN CHANNELS	
1. SETTLEMENT Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	
2. MATERIAL DEGRADATION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Material Type: Location (indicate on site map): Areal Extent: Degree of Degradation:	
3. EROSION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	
4. UNDERCUTTING Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	
5. OBSTRUCTIONS Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Type: Location (indicate on site map): Areal Extent: Size:	
6. VEGETATIVE GROWTH Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Type: Location (indicate on site map): Areal Extent:	
COVER PENETRATIONS	
1. GAS VENTS Active Passive Located: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Functioning: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Condition:	
2. GAS MONITORING PROBES Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Located: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Functioning: Yes <input type="checkbox"/> No <input type="checkbox"/> Condition:	
3. MONITORING WELLS Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Located: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Functioning: Yes <input type="checkbox"/> No <input type="checkbox"/> Condition:	



EPA RAC Contract # EP-S1-06-03

ITEM	REMARKS
4. LEACHATE EXTRACTION WELLS Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Located: Yes <input type="checkbox"/> No <input type="checkbox"/> Functioning: Yes <input type="checkbox"/> No <input type="checkbox"/> Condition:	
5. SETTLEMENT MONUMENTS Yes <input type="checkbox"/> No <input type="checkbox"/> Located: Yes <input type="checkbox"/> No <input type="checkbox"/> Functioning: Yes <input type="checkbox"/> No <input type="checkbox"/> Condition:	
COVER DRAINAGE LAYER	
1. OUTLET PIPES Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Functioning: Yes <input type="checkbox"/> No <input type="checkbox"/> Condition:	
2. OUTLET ROCK Yes <input type="checkbox"/> No <input type="checkbox"/> Functioning: Yes <input type="checkbox"/> No <input type="checkbox"/> Condition:	
DETENTION/SEDIMENTATION PONDS	
1. SILTATION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Areal Extent: Depth:	veg / trees in pond,
2. EROSION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Areal Extent: Depth:	
3. OUTLET WORKS Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Functioning: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Condition:	
RETAINING WALLS	
1. DEFORMATIONS Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Location (indicate on site map): Horizontal Displacement: Vertical Displacement: Rotational Displacement:	tilting, some areas of settling, unchanged since 5/2008
2. DEGRADATION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Description of Damage:	
VERTICAL BARRIER WALLS	
1. SETTLEMENT Yes <input type="checkbox"/> No <input type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	



EPA RAC Contract # EP-S1-06-03

ITEM	REMARKS
2. PERFORMANCE MONITORING Yes <input type="checkbox"/> No <input type="checkbox"/> Type of Monitoring: Frequency: Evidence of Breaching: Yes <input type="checkbox"/> No <input type="checkbox"/>	
GROUNDWATER SYSTEMS	
1. INTERCEPTOR TRENCH Damage: Yes <input type="checkbox"/> No <input type="checkbox"/> - Pumps Yes <input type="checkbox"/> No <input type="checkbox"/> - Piping, flow meters, etc. Yes <input type="checkbox"/> No <input type="checkbox"/> - 20,000-gal. storage tank Yes <input type="checkbox"/> No <input type="checkbox"/>	
LANDFILL GAS FLARE SYSTEM	
1. FLARE SYSTEM Damage: Yes <input type="checkbox"/> No <input type="checkbox"/> - Blower Yes <input type="checkbox"/> No <input type="checkbox"/> - Piping, flow meters, etc. Yes <input type="checkbox"/> No <input type="checkbox"/> - 20,000-gal. storage tank Yes <input type="checkbox"/> No <input type="checkbox"/> - Flare Yes <input type="checkbox"/> No <input type="checkbox"/> - Condensate Management Yes <input type="checkbox"/> No <input type="checkbox"/> Flare functioning? Yes <input type="checkbox"/> No <input type="checkbox"/>	
PERIMETER DITCHES/OFF-SITE DISCHARGE	
1. SILTATION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	
2. VEGETATION GROWTH Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Location (indicate on site map): Areal Extent: Type:	in detention basin
3. EROSION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	
4. 18-INCH HDPE OUTLET PIPE (North Basin) Functioning: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Condition:	
FENCING	
1. FENCING DAMAGE Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Description of Damage:	



EPA RAC Contract # EP-S1-06-03

ITEM	REMARKS
PERIMETER ROADS	
1. ROADS DAMAGED Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Description of Damage:	
SITE ACCESS	
1. ACCESS RESTRICTION Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
GENERAL	
1. VANDALISM Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Description of Damage:	
2. CHANGED SITE CONDITION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	

INTERVIEWS (conduct interviews if the following are present during inspection)	
1. INTERVIEW WORKERS ON SITE Problems: Suggestions: Attach Report	w/A ✓
2. INTERVIEW SITE NEIGHBORS Problems: Suggestions: Attach Report	
3. INTERVIEW LOCAL OFFICIALS Problems: Suggestions: Attach Report	
REVIEW DOCUMENTS	
1. GROUNDWATER MONITORING RECORDS Abnormalities:	w/A ✓
2. LANDFILL CLOSURE PROGRESS REPORT Report Date: Abnormalities:	
3. OPERATION AND MAINTENANCE PLAN Is there a plan in place? Yes <input type="checkbox"/> No <input type="checkbox"/> Is it being followed? Yes <input type="checkbox"/> No <input type="checkbox"/> Is it adequate? Yes <input type="checkbox"/> No <input type="checkbox"/>	

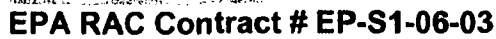


EPA RAC Contract # EP-S1-06-03

SEMI-ANNUAL LANDFILL INSPECTION CHECKLIST

Task Order: 0015-RX-ME-01B6 Weather: Sunny
 Site Name: BFI-Rockingham Landfill Temperature: 60°F
 Town: Rockingham Site Map: Attach Map
 State: Vermont Date of: 5/4/09
 PRP Representatives: Ralph Larimore (Mills Waste) Inspection:
 Inspection Team: B. Wheeler (Nobis)

ITEM	REMARKS
LANDFILL SURFACE	
1. SETTLEMENT (LOW SPOTS) Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	Small slump near dumpchuck NW of Northern detention basin - unchanged since F2008
2. CRACKS Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Location (indicate on site map): Length: Width: Depth:	Slight creep/surface cracks up N of NE detention basin unchanged since F2008
3. EROSION Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	- slope creep area (see above) just fill use in F2008, unchanged - slow erosion near EW-36
4. HOLES Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Depth: Suspected Cause (rodent or other):	
5. VEGETATIVE COVER Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Grass: Condition: Trees/Shrubs: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Size:	- mower damage near top access road - below EW-22
6. ARMORED COVER Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Material Type: Condition:	
7. BULGES Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Height: Suspected Cause (gas pressure or other):	



2



EPA RAC Contract # EP-S1-06-03

ITEM	REMARKS
LETDOWN CHANNELS	
1. SETTLEMENT Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	
2. MATERIAL DEGRADATION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Material Type: Location (indicate on site map): Areal Extent: Degree of Degradation:	
3. EROSION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	
4. UNDERCUTTING Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	
5. OBSTRUCTIONS Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Type: Location (indicate on site map): Areal Extent: Size:	
6. VEGETATIVE GROWTH Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Type: Location (indicate on site map): Areal Extent:	
COVER PENETRATIONS	
1. GAS VENTS Active Passive Located: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Functioning: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Condition:	
2. GAS MONITORING PROBES Located: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Functioning: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Condition:	
3. MONITORING WELLS Located: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Functioning: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Condition:	



EPA RAC Contract # EP-S1-06-03

ITEM	REMARKS
4. LEACHATE EXTRACTION WELLS Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Located: Yes <input type="checkbox"/> No <input type="checkbox"/> Functioning: Yes <input type="checkbox"/> No <input type="checkbox"/> Condition:	
5. SETTLEMENT MONUMENTS Yes <input type="checkbox"/> No <input type="checkbox"/> Located: Yes <input type="checkbox"/> No <input type="checkbox"/> Functioning: Yes <input type="checkbox"/> No <input type="checkbox"/> Condition:	
COVER DRAINAGE LAYER	
1. OUTLET PIPES Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Functioning: Yes <input type="checkbox"/> No <input type="checkbox"/> Condition:	
2. OUTLET ROCK Yes <input type="checkbox"/> No <input type="checkbox"/> Functioning: Yes <input type="checkbox"/> No <input type="checkbox"/> Condition:	
DETENTION/SEDIMENTATION PONDS	
1. SILTATION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Areal Extent: Depth:	veg/trees in ponds
2. EROSION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Areal Extent: Depth:	
3. OUTLET WORKS Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Functioning: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Condition:	
RETAINING WALLS	
1. DEFORMATIONS Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Location (indicate on site map): Horizontal Displacement: Vertical Displacement: Rotational Displacement:	tilting + settling areas, unchanged since F2003
2. DEGRADATION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Description of Damage:	
VERTICAL BARRIER WALLS	
1. SETTLEMENT Yes <input type="checkbox"/> No <input type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	



EPA RAC Contract # EP-S1-06-03

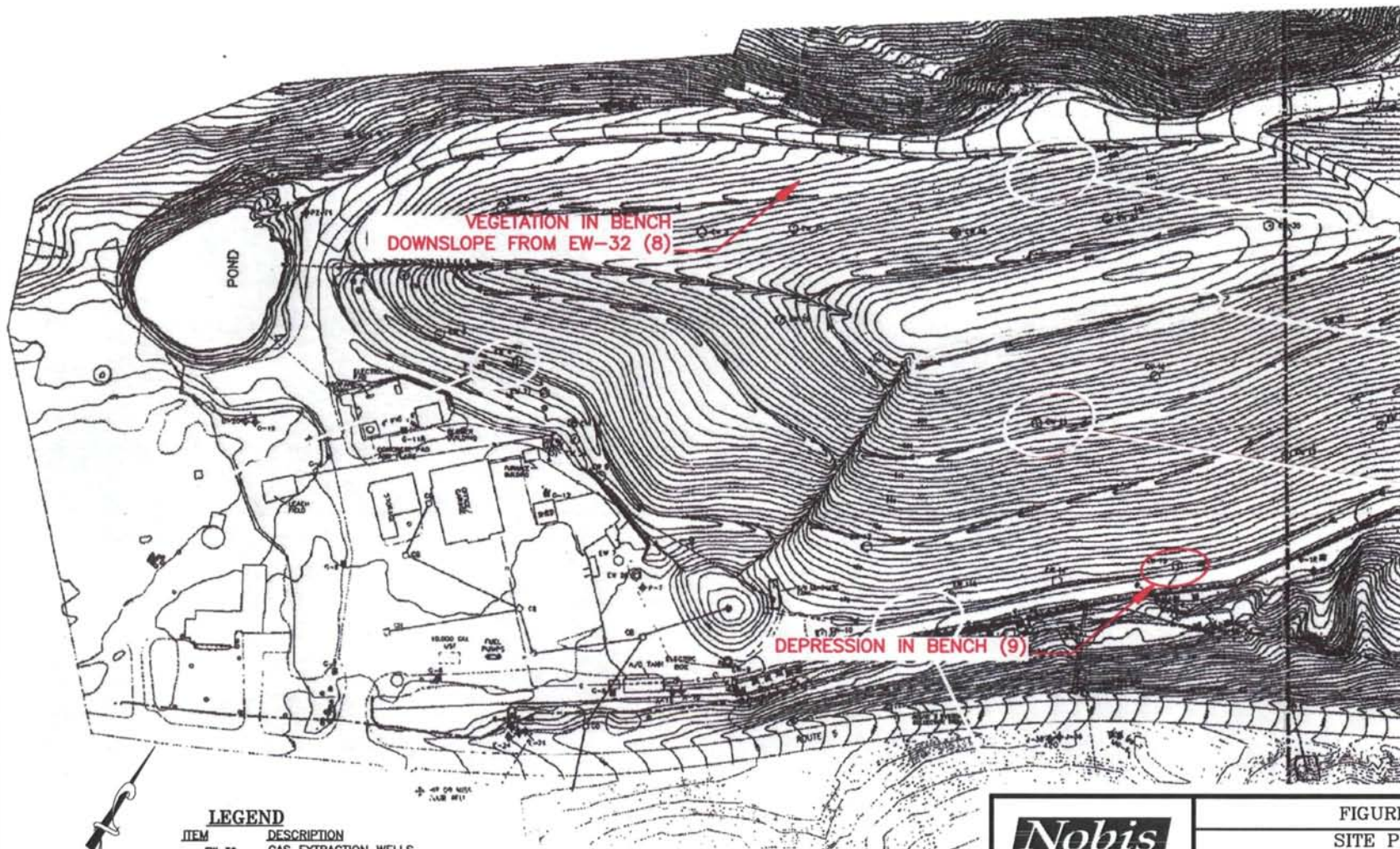
ITEM	REMARKS
2. PERFORMANCE MONITORING Yes <input type="checkbox"/> No <input type="checkbox"/> Type of Monitoring: Frequency: Evidence of Breaching: Yes <input type="checkbox"/> No <input type="checkbox"/>	
GROUNDWATER SYSTEMS	
1. INTERCEPTOR TRENCH Damage: Yes <input type="checkbox"/> No <input type="checkbox"/> - Pumps Yes <input type="checkbox"/> No <input type="checkbox"/> - Piping, flow meters, etc. Yes <input type="checkbox"/> No <input type="checkbox"/> - 20,000-gal. storage tank Yes <input type="checkbox"/> No <input type="checkbox"/>	
LANDFILL GAS FLARE SYSTEM	
1. FLARE SYSTEM Damage: Yes <input type="checkbox"/> No <input type="checkbox"/> - Blower Yes <input type="checkbox"/> No <input type="checkbox"/> - Piping, flow meters, etc. Yes <input type="checkbox"/> No <input type="checkbox"/> - 20,000-gal. storage tank Yes <input type="checkbox"/> No <input type="checkbox"/> - Flare Yes <input type="checkbox"/> No <input type="checkbox"/> - Condensate Management Yes <input type="checkbox"/> No <input type="checkbox"/> Flare functioning? Yes <input type="checkbox"/> No <input type="checkbox"/>	
PERIMETER DITCHES/OFF-SITE DISCHARGE	
1. SILTATION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	
2. VEGETATION GROWTH Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Location (indicate on site map): Areal Extent: Type:	<i>in detention basins</i>
3. EROSION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Areal Extent: Depth:	
4. 18-INCH HDPE OUTLET PIPE (North Basin) Functioning: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Condition:	
FENCING	
1. FENCING DAMAGE Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Description of Damage:	



EPA RAC Contract # EP-S1-06-03

ITEM	REMARKS
PERIMETER ROADS	
1. ROADS DAMAGED Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Description of Damage:	
SITE ACCESS	
1. ACCESS RESTRICTION Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
GENERAL	
1. VANDALISM Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Location (indicate on site map): Description of Damage:	
2. CHANGED SITE CONDITION Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	

INTERVIEWS (conduct interviews if the following are present during inspection)	
1. INTERVIEW WORKERS ON SITE Problems: Suggestions: Attach Report	N/A ↓
2. INTERVIEW SITE NEIGHBORS Problems: Suggestions: Attach Report	
3. INTERVIEW LOCAL OFFICIALS Problems: Suggestions: Attach Report	
REVIEW DOCUMENTS	
1. GROUNDWATER MONITORING RECORDS Abnormalities:	N/A ↓
2. LANDFILL CLOSURE PROGRESS REPORT Report Date: Abnormalities:	
3. OPERATION AND MAINTENANCE PLAN Is there a plan in place? Yes <input type="checkbox"/> No <input type="checkbox"/> Is it being followed? Yes <input type="checkbox"/> No <input type="checkbox"/> Is it adequate? Yes <input type="checkbox"/> No <input type="checkbox"/>	



LEGEND

ITEM	DESCRIPTION
○ EW-36	GAS EXTRACTION WELLS
(12)	AT END OF LABELS, REFERS TO ITEM NUMBERS IN REPORT

Nobis

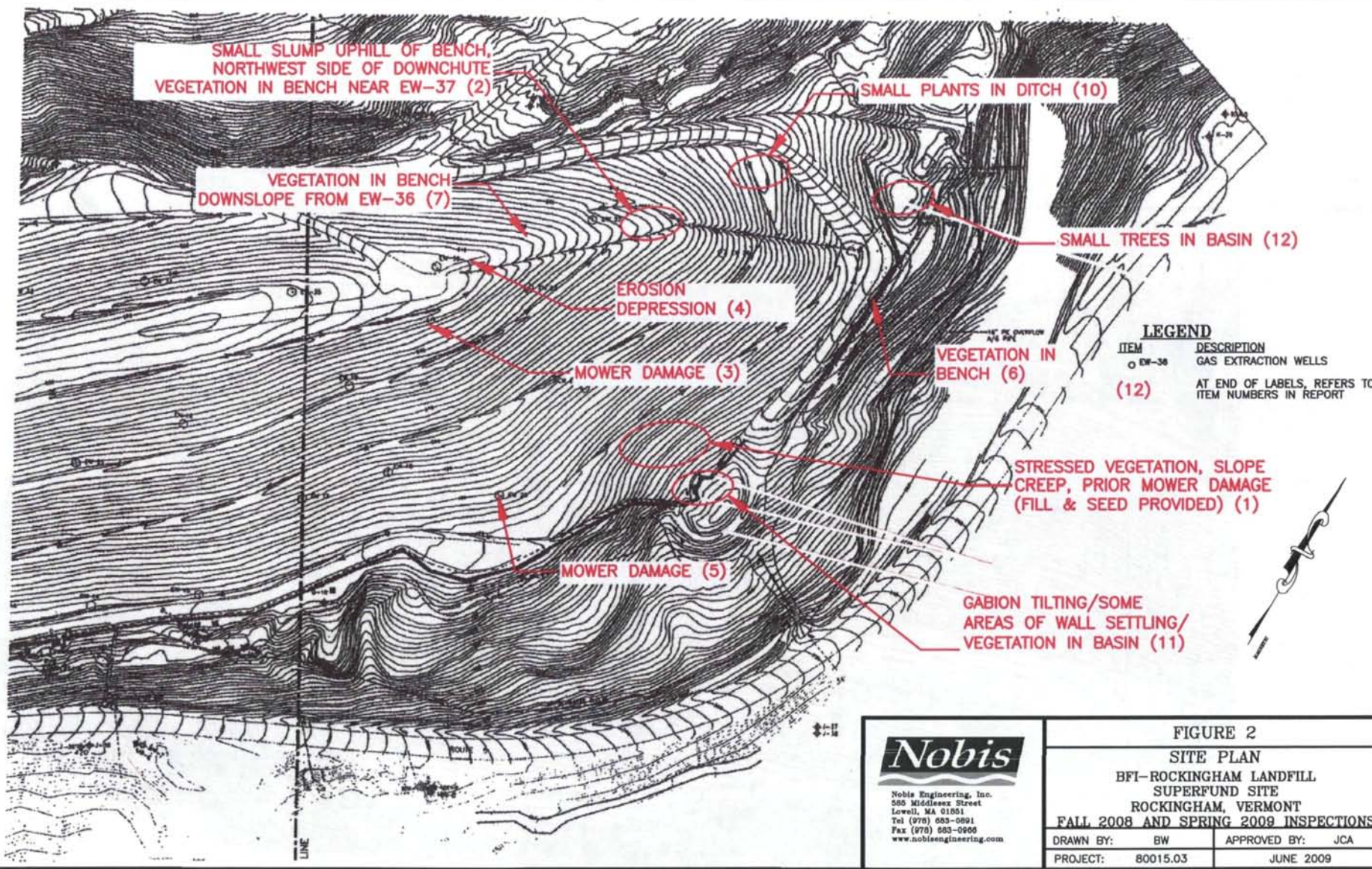
Nobis Engineering, Inc.
585 Middlesex Street
Lowell, MA 01851
Tel (978) 653-0801
Fax (978) 653-0905
www.nobisengineering.com

FIGURE 1

SITE PLAN
BFI-ROCKINGHAM LANDFILL
SUPERFUND SITE
ROCKINGHAM, VERMONT

FALL 2008 AND SPRING 2009 INSPECTIONS

DRAWN BY: BW	APPROVED BY: JCA
PROJECT: 80015.03	JUNE 2009



Attachment 2

**Site Inspection Photographs
November 6, 2008**



Photo 1 Above northeastern detention basin, area of stressed vegetation, slope creep, and visible membrane



Photo 2 Small slump (photo looking uphill) northwest of the downchute discharging to northern detention basin



Photo 3 Bench vegetation near northern downchute



Photo 4 Vegetation in northeastern detention basin



Photo 5 Northern detention basin



Photo 6 Detention basin near Site's parking lot with minor amounts of vegetation



Photo 7 Landfill gas flare

Attachment 3

**Site Inspection Photographs
May 4, 2009**



Photo 1 Above northeastern detention basin, area of stressed vegetation, slope creep, and visible membrane



Photo 2 Small slump (photo looking downhill) northwest of the downchute discharging to northern detention basin



Photo 3 Thin grass and mower damage, off access road opposite EW-36



Photo 4 Depression possibly created by storm water, near EW-36



Photo 5 Mower damage below EW-22



Photo 6 Bench vegetation near northeastern downchute



Photo 7 Bench vegetation near EW-37



Photo 8 Depression in bench near EW-15



Photo 9 Gas extraction well EW-36



Photo 10 Vegetation in northeastern detention basin



Photo 11 Small trees in northern detention basin



Photo 12 Detention basin near Site's parking lot – minor amounts of vegetation present in Fall 2008 have been removed



Photo 13 Settling along top of northeastern detention basin's retaining wall



Photo 14 Settling along top of northeastern detention basin's retaining wall



Photo 15 18" diameter HDPE overflow pipe from northern detention basin



Photo 16 Route 5 interceptor trench



Photo 17 Seep 6 Area

APPENDIX E – INTERVIEW DOCUMENTATION

INTERVIEW DOCUMENTATION FORM

The following is a list of individuals interviewed for this five-year review. See the attached interview record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
Michael B. Smith	Environmental Analyst	Vermont DEC	5/20/09
Name	Title/Position	Organization	Date
Ralph Larimore	Environmental Manager	Allied/Republic Services	5/20/09
Name	Title/Position	Organization	Date
Roger Bellarose	Principal	BGEC, LLC	5/20/09
Name	Title/Position	Organization	Date
Edward Hathaway	Remedial Project Manager	U.S. Environmental Protection Agency	5/22/09
Name	Title/Position	Organization	Date
Jim Muller	Municipal Manager	Town of Rockingham	5/22/09
Name	Title/Position	Organization	Date
Howard Rumrill	Resident	Homeowner	5/22/09
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date

INTERVIEW RECORD

Site Name: BFI Rockingham Landfill	EPA ID No.: VTD980520092	
Subject: Third Five-Year Review	Time: 10:30 AM	Date: 5/20/09
Type: <input checked="" type="checkbox"/> Telephone , Visit , Other	Incoming <input type="checkbox"/> X Outgoing	
Location of Visit:		

CONTACT MADE BY

Name: Forest Lyford	Title: Geologist	Organization: USACE
---------------------	------------------	---------------------

INDIVIDUAL CONTACTED:

Name: Michael B. Smith	Title: Environmental Analyst	Organization: Vermont Department of Environmental Conservation
Telephone No: (802) 242-3879		Street Address: 103 South Main St., West Bldg. City, State, Zip: Waterbury, VT 05671-0404
Fax No:		
E-Mail Address: Michael.B.Smith@state.vt.us		

SUMMARY OF CONVERSATION

Q1: What is your overall impression of the project and Site?
A1: Major work is done at the Site. Long-term monitoring has demonstrated successful landfill closure.

Q2: Are you aware of any issues the five-year review should focus on?
A2: Demonstrate that the remedy is still working. Groundwater has been reclassified at the Site and should be addressed accordingly in the review.

Q3: Who should USACE speak to in the community to solicit local input?
A3: No suggestions

Q4: Is the remedy functioning as expected?
A4: Yes

Q5: Is the Town actively involved in the Site or do they show an active interest?
A5: Don't know.

Q6: Do you have any comments or suggestions regarding the Site's management or operation?
A6: No.

Q7: Are you aware of any community concerns regarding the Site or its operation and administration?
A7: No.

Q8: Have there been any changes in the Site or surrounding property in the last 5 years, or are changes planned?
A8: Groundwater has been reclassified.

Q9: Have there been any complaints or incidents that required a response by your office?
A9: No.

INTERVIEW RECORD

Site Name: BFI Rockingham Landfill	EPA ID No.: VTD980520092	
Subject: Third Five-Year Review	Time: 11:00 AM	Date: 5/20/09
Type: <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> Visit <input type="checkbox"/> Other	Incoming <input type="checkbox"/> X Outgoing	
Location of Visit:		

CONTACT MADE BY

Name: Forest Lyford	Title: Geologist	Organization: USACE
---------------------	------------------	---------------------

INDIVIDUAL CONTACTED:

Name: Ralph Larimore	Title: Environmental Manager	Organization: Allied/Republic
Telephone No: (716) 282-2676	Street Address: 5600 Niagara Fall Blvd.	
Fax No:	City, State, Zip: Niagara, NY 14304	
E-Mail Address: rlarimore@republicservices.com		

SUMMARY OF CONVERSATION

Q1: What is your overall impression of the project and Site?

A1: The Site is very stable and routine.

Q2: Are you aware of any issues the five-year review should focus on?

A2: No

Q3: Who should USACE speak to in the community to solicit local input?

A3: He suggested the following local residents: Howard Rumrill, Wayne Johnson, Brian Glynn, Kevin Greenwood, and Mr. and Mrs. John Banholzer

Q4: Is the remedy functioning as expected?

A4: Mainly it is, but the cleanup goal has not been met. BFI plans to revisit remediation strategies.

Q5: Is the Town actively involved in the Site or do they show an active interest?

A5: No

Q6: Do you have any comments or suggestions regarding the Site's management or operation?

A6: None. Allied/Republic has a team of consultants and resources available to manage the facility.

Q7: Are you aware of any community concerns regarding the Site or its operation and administration?

A7: No

Q8: Have there been any changes in the Site or surrounding property in the last 5 years, or are changes planned?

A8: One building was torn down recently. A fueling station and underground storage tank is currently being removed.

Q9: Has there been any unusual or unexpected activity at the Site?

A9: No

Q10: What is the frequency of O&M activities?

A10: Groundwater is sampled semiannually. Residential wells are sampled on a five-year rotation. Leachate is hauled 2 or 3 times a week. The Site is inspected semiannually.

Q11: Have there been unexpected O&M difficulties in the last 5 years?

A11: Incidents are minor and routine for the systems in place.

Q12: Have there been opportunities to optimize O&M or sampling efforts?

A12: The number of Site wells sampled has been reduced as water met cleanup criteria goals. BFI is effectively optimizing all parts of the cleanup plan.

Q13: Have there been any complaints or incidents that required a response by your office?

A13: No.

INTERVIEW RECORD

Site Name: BFI Rockingham Landfill		EPA ID No.: VTD980520092	
Subject: Third Five-Year Review		Time: 1:00 PM	Date: 5/20/09
Type: <input checked="" type="checkbox"/> Telephone . Visit . Other		Incoming <input type="checkbox"/> X Outgoing	
Location of Visit:			

CONTACT MADE BY

Name: Forest Lyford	Title: Geologist	Organization: USACE
---------------------	------------------	---------------------

INDIVIDUAL CONTACTED:

Name: Roger Bellerose	Title: Principal	Organization: BGEG, LLC
Telephone No: (603) 759-7806		Street Address: 127 Tirrell Hill Rd.
Fax No:		City, State, Zip: Goffstown, NH 03045
E-Mail Address: Roger-97@comcas.net		

SUMMARY OF CONVERSATION

Q1: What is your overall impression of the project and Site?

A1: The Site has been well maintained. The remediation system has been maintained and Site conditions are improving.

Q2: Are you aware of any issues the five-year review should focus on?

A2: Manganese and some VOCs remain above cleanup levels.

Q3: Who should USACE speak to in the community to solicit local input?

A3: Kevin Greenwood, former operator; Howard Rumrill.

Q4: Is the remedy functioning as expected?

A4: Yes, but cleanup goals have not been met.

Q5: Is the Town actively involved in the Site or do they show an active interest?

A5: The town is not interested.

Q6: Do you have any comments or suggestions regarding the Site's management or operation?

A6: The Site is currently well managed and maintained.

Q7: Are you aware of any community concerns regarding the Site or its operation and administration?

A7: No

Q8: Have there been any changes in the Site or surrounding property in the last 5 years, or are changes planned?

A8: There have been no changes since the early 1990's.

Q9: Has there been any unusual or unexpected activity at the Site?

A9: No.

Q10: What is the frequency of O&M activities?

A10: All wells are sampled within a five-year period.

Q11: Have there been unexpected O&M difficulties in the last 5 years?

A11: An underground fuel storage tank has just been removed (5/20/09) to resolve a compliance issue with the state.

Q12: Have there been opportunities to optimize O&M or sampling efforts?

A12: Some groundwater sampling points have been dropped.

Q13: Have there been any complaints or incidents that required a response by your office?

A13: No incidents.

INTERVIEW RECORD

Site Name: BFI Rockingham Landfill		EPA ID No.: VTD980520092	
Subject: Third Five-Year Review		Time:	Date: 5/22/2009
		AM/PM	
Type: <u>Telephone</u> . Visit . Other: Completed written form. X Location of Visit:		Incoming X. Outgoing	

CONTACT MADE BY

Name: Forest Lyford	Title: Geologist	Organization: USACE
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INDIVIDUAL CONTACTED:

Name: Edward Hathaway	Title: RPM	Organization: EPA
Telephone No: (617)918-1372	Street Address: 1 Congress Street, Suite 1100	
Fax No: (617) 918-0372	City, State, Zip: Boston, MA 02114	
E-Mail Address: Hathaway.ed@epa.gov		

SUMMARY OF CONVERSATION

Q1: What is your overall impression of the project and Site?

A1: I believe the project is fairly successful. The landfill cap is intact and the gas system remains operational. The PRP has performed the required activities. There has been good cooperation amongst the parties to date.

Q2: Are you aware of any issues the five-year review should focus on?

A2: No, the five year can acknowledge that the chance of achieving the performance objectives set in the ROD and CD are low. That issue, however, would be the subject of the next five year review since the compliance date is in 2011.

Q3: Who should USACE speak to in the community to solicit local input?

A3: Adjacent landowners and Town Clerk.

Q4: Is the remedy functioning as expected?

A4: The source control actions are functioning as expected. The monitored natural recovery does not appear to be occurring at the rate anticipated. It may be that more time is required or that aquifer conditions are not favorable to recovery. The critical issue is that the cap prevent contact with the waste, the plume is not expanding and does not impact any current water supplies, and the residents have a clean water supply.

Q5: Is the Town actively involved in the Site or do they show an active interest?

A5: No, they are content to wait until issues require there attention. They were quite involved during the construction period.

Q6: Do you have any comments or suggestions regarding the Site's management or operation?

A6: The maintenance and monitoring have been implemented as required and expected. No concerns or recommendations regarding LTM or maintenance. The remedy re-evaluation will require a significant technical evaluation and may include the need for additional data gathering beyond the LTM program.

Q7: Are you aware of any community concerns regarding the Site or its operation and administration?

A7: Not at this time. The main issue for the adjacent residents is the water line. There are periodic issues with a culvert installed for Vermont DOT.

Q8: Have there been any changes in the Site or surrounding property in the last 5 years, or are changes planned?

A8: None that I am aware of. The Site looked similar to the previous year. No new homes have been constructed. There may have been one change in property ownership.

Q9: Has there been any unusual or unexpected activity at the Site?

A9: None.

Q10: What is the frequency of O&M activities?

A10: Fall and spring inspections, regular visits to balance the gas system and check for erosion.

Q11: Have there been unexpected O&M difficulties since in the last 5 years?

A11: None.

Q12: Have there been opportunities to optimize O&M or sampling efforts?

A12: The only issue is whether there is a more cost effective way to manage the leachate.

Q13: Have there been any complaints or incidents that required a response by your office?

A13: None.

INTERVIEW RECORD

Site Name: BFI Rockingham Landfill		EPA ID No.: VTD980520092	
Subject: Third Five-Year Review		Time: 11:00 AM	Date: 5/22/09
Type: <input checked="" type="checkbox"/> Telephone, <input type="checkbox"/> Visit, <input type="checkbox"/> Other		Incoming <input type="checkbox"/> Outgoing <input checked="" type="checkbox"/>	
Location of Visit:			

CONTACT MADE BY

Name: Forest Lyford	Title: Geologist	Organization: USACE
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INDIVIDUAL CONTACTED:

Name: Jim Mullen	Title: Town Manager	Organization: Town of Rockingham, VT
Telephone No: (802) 463-3964	Street Address: 7 Square, P.O. Box 370	
Fax No:	City, State, Zip: Bellows Fall, VT 05101	
E-Mail Address:		

SUMMARY OF CONVERSATION

Q1: What is your overall impression of the project and Site?

A1: The Site is very stable. No issues have been raised.

Q2: Are you aware of any issues the five-year review should focus on?

A2: No issues. The Public Works Superintendent used to work at the Site and is very familiar with the Site. He reports that there are no issues.

Q3: Are you aware of any community concerns regarding the Site or its operation and administration?

A3: The Site is isolated from the village and doesn't elicit concerns from Town residents.

Q4: Have there been any complaints or incidents that required a response by your office?

A4: None

Note: Mr. Mullen stated that VHP Pioneer conducted a groundwater assessment of the town and prepared a report. Meddie Perry is the contact at (802) 425-7788.

INTERVIEW RECORD

Site Name: BFI Rockingham Landfill	EPA ID No.: VTD980520092	
Subject: Third Five-Year Review	Time: 11:00 AM	Date: 5/22/09
Type: <input checked="" type="checkbox"/> Telephone . Visit . Other Location of Visit:	Incoming <input type="checkbox"/> X Outgoing	

CONTACT MADE BY

Name: Forest Lyford	Title: Geologist	Organization: USACE
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INDIVIDUAL CONTACTED:

Name: Howard Rumrill	Title: Resident	Organization: Town of Rockingham, VT
Telephone No: (802) 463-3964	Street Address:	
Fax No:	City, State, Zip:	
E-Mail Address:		

SUMMARY OF CONVERSATION

Q1: What is your overall impression of the project and Site?

A1: He has not observed any problems. He commented that his spring is sampled periodically.